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Cognitive abilities, affective characteristics and learning strategies as related to academic achievement among first year nursing students: test validation and causal modelling

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Cognitive abilities, affective characteristics and learning strategies as related to academic achievement among first year nursing students: Test validation and causal modeling

by

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INTRODUCTION

Background for Study

The academic achievement of college students has been and continues to be a major concern of educators. Measures of academic achievement are used to assess the amount of learning that has occurred within individuals attending college. Nurse educators are concerned about the academic achievement of nursing students because the attrition rate of nursing students is high and the educational resources are limited.

Behaviorist learning theory

Historically, educators have viewed student achievement to depend greatly on what the instructor presents, taking a stimulus-response view to learning. The learning achieved by students is viewed as the response to the stimulus of teaching. This perspective has become known as the behaviorist or stimulus-response (S-R) learning theory and was developed from the work of Skinner (1969, 1974). In this approach students are viewed as passive participants who record the stimuli as presented by the teacher. The major focus of the behaviorist approach is teaching strategies. Emphasis is placed on how the presentation of information influences the learner's behavior (Weinstein & Mayer, 1986).

Farnham-Diggory (1977) notes that the S-R approach has a limited view of learning as it is based on the idea that "a stimulus goes in, a response comes out, and what happens in between is summarized by a hyphen" (p. 128).

Cognitive learning theory

In the 1960s, cognitive psychology emerged and a different view of the teaching-learning process developed. The learner was no longer viewed as a passive recorder of stimuli presented by the teacher, but as an active participant in the learning process. From the perspective of the cognitive approach to learning, one seeks to understand how incoming information is processed by the individual and structured into memory (Weinstein & Mayer, 1986). Farnham-Diggory (1977) noted that "now, instead of a hyphen [S-R] we have mental structures and processes" (p. 128).

With this cognitive view of the teaching-learning process, educational researchers came to consider effective teaching to include such important aspects as teaching students how to learn, how to remember, how to think and how to motivate themselves (Norman, 1980; Weinstein & Mayer, 1986). The academic achievement of students has been seen to depend jointly on two factors - 1) what information is presented and 2) how the learner

processes that information and two distinctly different types of goals have developed for teaching. One goal concerns the product of learning - "what" the student is to learn. This goal focuses on what a student should know or be able to do as the result of learning. The second goal concerns the process of learning - "how" the student learns. This goal focuses on the techniques and strategies used by a student to accomplish learning (Weinstein & Mayer, 1986).

Academic achievement

Numerous research studies have been conducted suggesting that academic achievement depends partly on what the learner knows (prior knowledge) and partly on what the learner thinks about during learning (active cognitive processing) (e.g., Cook & Mayer, 1983; Dansereau, 1985; Jones, Amiran & Katims, 1985; Weinstein & Underwood, 1985). The following sections discuss various variables that have been proposed to affect academic achievement.

Previous academic achievement and cognitive ability

Previous academic achievement and cognitive ability have been shown through numerous studies to be good predictors of future academic achievement (e.g., Bendow & Minor, 1986; Hayes, 1981). Nurse researchers have

conducted several studies exploring variables predicting nursing academic achievement (e.g., Felts, 1986; Glick, McClelland & Yang, 1986; Yess, 1980).

Predictive studies in nursing have been conducted for a variety of reasons. One reason is that educational resources are limited for nursing programs. Nursing education is known to be costly with limited funds and limited qualified faculty being available. Another reason is the need to decrease high attrition rates of students without sacrificing academic standards. As the number of students who fail to successfully complete their nursing program increases, a decrease in the number of graduate nurses occurs. In addition, students invest extensive financial, physiological and psychological resources to their nursing education. Individuals who fail to successfully complete the nursing program suffer in a variety of ways from this unsuccessful experience (Glick et al., 1986; Hayes, 1981; Oliver, 1985).

These research studies have identified two strong predictor variables for nursing academic achievement - 1) previous academic achievement and 2) cognitive ability (e.g., Allchnie & Bellucci, 1981; Felts, 1986; Glick et al., 1986; Hayes, 1981; Oliver, 1985; Yess, 1980). Previous academic achievement was usually measured by grade point average (GPA). A variety of courses and a

variety of ways have been used to calculate GPA. Cognitive ability was frequently measured by scores obtained by students on the ACT or SAT.

Although a variety of variables have been studied in these predictive studies, variables related to the learning process have not been included. Nurse researchers have conducted limited studies exploring how the learning process affects the academic achievement of nursing students. Nurse researchers need to investigate how students' processing, restoring and retrieving of information affect their academic achievement.

Learning strategies

In studying and researching the process of learning, new constructs have been proposed. One such construct is learning strategies. In a very broad sense the term learning strategies refers to a "number of different competencies...necessary, or helpful, for effective learning and retention of information for later use" (Weinstein & Underwood, 1985, p. 241).

Wittrock (1974, 1976) defines the effective learner as an individual who actively processes, interprets and synthesizes information, using a variety of different strategies to store and retrieve information. One of the first researchers to investigate the methods by which

individuals transform or code incoming information to make it easier to learn was George Miller (1956). He found that our immediate memory has severe limitations on the amount of information it is able to receive, process and remember. He discovered that this informational bottleneck can be broken or at least stretched by organizing information into groups or "chunks". Miller is noted for his view that recoding is the very lifeblood of thought processes.

Frequently the broad concept of learning strategies is further divided into substrategies. Learning strategy theorists have not achieved consensus as to what elements constitute these substrategies. Dansereau (1985) divides learning strategies into primary strategies and support strategies. The primary strategies include techniques for acquiring, comprehending and storing information as well as techniques for retrieving and using stored information. Support strategies are techniques used to help the learner maintain a suitable internal and external environment conducive for learning.

Weinstein and Underwood (1985) divide the concept of learning strategies into three major substrategies - 1) cognitive information-processing strategies, 2) active study strategies and 3) support strategies. Cognitive information processing strategies are techniques used to

organize and elaborate on incoming information, making it more meaningful. Active study strategies include such behaviors as systems for note-taking and test preparation. Support strategies are viewed as techniques used for organizing study time, coping with performance anxiety, and directing attention to the learning task on hand (Weinstein & Underwood, 1985). In addition, Weinstein and Mayer (1986) state that the process of learning includes the use of comprehensive monitoring. The term comprehensive monitoring refers to the student's establishing learning goals, assessing the degree to which the goals are being met and, if necessary, modifying the strategies being used to meet these goals (Weinstein & Mayer, 1986; Weinstein & Rogers, 1985).

Test anxiety

Studies suggest that test anxiety has a negative effect on student performance (e.g., Culler & Holahan, 1980; Hollandsworth, Glazeski, Kirkland, Jones, & Van Norman, 1979; Phillips, 1988; Spielberger, 1966). Although the reported correlations between performance and test anxiety have been moderate, Dendato and Diener (1986) contend that there is little doubt the two variables are connected. However, debates over the exact nature of this relationship continue as researchers

explore the effects of multiple variables on academic achievement.

Test anxiety and study skills

Researchers have studied the interrelationship of anxiety and study skills and their joint effect on academic achievement. Several research studies suggest that the variable study habits has a positive relationship and anxiety has a negative relationship with test performance (Benjamin, McKeachie, Lin, & Holinger, 1981; Desiderato & Koskinen, 1969; Lin & McKeachie, 1970). Other research findings suggest that poor academic achievement of highly test-anxious students is the result of ineffective study skills and habits (Brown & Nelson, 1983; Culler & Holahan, 1980; Flavell, 1979; Kirkland & Hollandsworth, 1979). This view has been labeled as the skills deficit hypothesis. However, Tobias (1986) points out that the skills deficit hypothesis does not explain why performance differences between high and low test anxious students occur mainly in stress situations and not in non-stress situations.

Naveh-Benjamin, McKeachie and Lin (1987) contend that two types of test-anxious students exist. One is the highly test-anxious student with poor study habits who is not able to encode and organize material to be

learned. The second is the highly test-anxious student with good study habits, who is able to encode and organize information, but has difficulty in retrieving the information in evaluative situations.

Test anxiety reduction and study skills programs

Researchers studying the effect of anxiety reduction programs have found behavioral and cognitive therapies to be successful in reducing anxiety, but not to be successful in improving cognitive performance (D'Alello & Murray, 1981; Finger & Galassi, 1977; Hollandsworth et al., 1979; Holroyd, 1976; Holroyd, Westbrook, Wolf & Badhorn, 1978; McCordick, Kaplan, Finn, & Smith, 1979). Lent and Russell (1978) studied the separate and combined effect of systematic desensitization and study skills training on test anxiety and academic performance. Their results indicate that the combination of study skills training and systematic desensitization is effective and superior to either component alone, both in reducing anxiety and in improving academic performance. This suggests that an interactive relationship exists between anxiety and study skills with regard to their influence on academic achievement.

Motivation

The role motivation plays in academic achievement is not clearly delineated. Weinert (1987) cites two contradictory examples of the effect of motivation in our everyday life experiences. The first example addresses students studying for an important exam whose extreme motivation to do well actually interferes with efficient learning. The second example refers to school children who seem less gifted than their peers, but learn effectively when they are keenly interested and highly motivated.

The role motivation plays in learning needs to be more clearly delineated. Davies (1986) contends that the "study of motivation is important because it is almost certainly the case that for various reasons many students fail to fulfill their potential ability" (p. 13).

Life stress

Life stress is a "product of changes that occur in one's life that require adaptation, coping and social adjustment . . . . Although everyone experiences life changes, it is usually assumed that it is when high levels of change are experienced within a relatively short period of time that there are deleterious effects" (Johnson & Sarason, 1978, p. 151).

Limited research has been conducted on the effect life stress has on the learning process. Several researchers (de Meuse, 1985; Garrity & Ries, 1985; Harris, 1973; Lloyd, Alexander, Rice and Greenfield, 1980) found life stress to have a significant negative effect on academic achievement. Grade point average was found to be inversely related to the amount of life change recently experienced. These findings support that life stress may be an important variable affecting the learning process as demonstrated in academic achievement of students.

Summary

Learning is variable and complex, making it difficult to study. Studies have shown that past academic achievement has a strong influence on future academic achievement. The question is WHY? It is suggested that students' academic success is related to their cognitive ability. But then, one questions why under certain circumstances students with less cognitive ability are just as successful or even more successful than students with greater cognitive ability. Researchers in education and psychology are suggesting that the students' learning strategies and test anxiety play an important role in the academic achievement of

students. For students to be successful, they must have effective learning strategies and low test anxiety and not just cognitive ability.

However, researchers have found that some students with effective learning strategies, low test anxiety and ample cognitive ability do not always obtain academic success. One suggestion for this occurrence is the students' lack of motivation. Without sufficient motivation students may tend to use their time poorly and not to concentrate when studying. Furthermore, some students are not successful academically although they are motivated, have low test anxiety and possess the necessary cognitive ability and learning strategies. In these cases, it might be proposed that life stresses may interfere with students' academic achievement. Although many constructs have been identified to account for various types of learning failure, the question remains as to how these various variables fit together, impacting on the learning process and academic achievement of college students.

Need for Study

One problem faced by educational researchers studying the academic achievement of students is the lack of valid and reliable instruments for the comprehensive

measurement of an individual's studying strengths and deficits (Mealey, 1988). Instruments assessing an individual's learning process frequently measure one's study practices. One example is the Survey of Study Habits and Attitudes (Brown & Holtzman, 1953). Since learning strategies have become the focus of studies investigating effective learning, instruments like the Inventory of Learning Processes (ILP: Schmeck, 1983), have been developed to measure an individual's learning strategies. The Learning and Study Strategies Inventory (LASSI) is a promising instrument for the assessment of an individual's learning strategies, but requires empirical validation.

The second problem faced by researchers is the identification of all significant variables affecting the learning process of students and investigating how these various variables interrelate. Typically the effect variables have on the learning process of undergraduate students is studied via the measurement of academic achievement. Numerous studies have investigated the relationships of various variables and academic achievement of students. The variables include cognitive ability, (e.g., Allchnie & Bellucci's, 1981; Glick et al., 1986; Hayes, 1981; Kissinger & Munjas, 1982), test anxiety (e.g., Brown & Nelson, 1983; Bruch, Pearl &

Giordana, 1986; Culler & Holahan, 1980; Sarason, 1980; Tobias, 1986), life stress (e.g., de Meuse, 1985; Garrity & Ries, 1985; Lloyd et al., 1980), self-efficacy (Weiner, 1980), motivation (e.g., Wlodkowski, 1985), and study strategies (e.g., Garner & Taylor, 1982; Jare & Smith, 1982; Weinstein & Rogers, 1986).

Causal models of academic achievement have been developed to explain the effect various variables have on academic achievement (Bean, 1980, Munro, 1981; Pascarella & Chapman, 1983; Pascarella & Terenzini, 1980; Tinto, 1975). Academic achievement in these studies have been measured by persistence in the educational institution. In these studies path analyses were conducted to investigate the interrelationships among the variables of student background, institutional characteristics, academic integration, social integration and persistence in college. Investigations testing these models show that a considerable portion of the variance in academic achievement remains unexplained, indicating other variables are affecting academic achievement. In addition to identifying all the significant variables affecting an individual's learning process, the interrelationships among these variables need to be explored with regard to their effect on learning.

Research reports support the view that these various components of learning are interrelated and interactive. There is sufficient overlap in the tasks and concerns of the constructs of cognition, anxiety, motivation and life stress to urge the research and development of an integrated learning model (Phillips, 1988; Weinert, 1987). However, the present theory of learning does not provide an adequate, acceptable model for analyzing learning effectiveness and the factors affecting it (Tobias, 1986). Further research is needed to clarify the interrelationship of the various components of the learning process.

Statement of the Problem

There are two components to the research problem of this study. The first is to examine the validity of the Learning and Study Strategies Inventory with undergraduate nursing students. The second is to develop and test a causal of model which explains the academic achievement of nursing students in terms of cognitive, affective and learning strategies variables.

Statement of Purpose

This study is designed to investigate the complex process of learning among 134 entering nursing students in a midwestern community college in two phases. In the

first, the construct validities and internal consistency reliability estimates of the ten scales of the LASSI instrument will be examined by computing correlations and factor analysis. In the second, the relationships and interrelationships of numerous variables with academic achievement are to be investigated, and a causal learning model of academic achievement will be developed and tested. The development of the model will be based on the results of the first phase of this study. The path analysis will be conducted using multiple regression techniques.

Statement of Assumptions

The assumptions that have been made with regard to this study are as follows:

1. All of the significant variables affecting the learning process have been identified and addressed in the study.

2. Verbal and math abilities are accurately measured by ASSET.

3. Accurate measures of learning strategies can be developed from the items of the Learning and Study Strategies Inventory.

4. Life stress is accurately measured by the negative life change score of the Life Experiences Survey.

Limitations of the Study

A major limitation of this study is the use of a convenience sample. The sample consists of first year nursing students at a community college. The results obtained may be atypical as the subjects in the study may differ significantly from the general population of college students.

A second limitation is the fact that one's learning strategies, attitude and motivation are constantly changing due to time, maturation and the development of the individual. Therefore, the measurement of learning strategies is not stable over long time intervals, making it difficult to determine the relationship of the various factors of learning to academic achievement.

A third limitation of the study is the attrition of the students. Frequently students drop a course prior to the end of a semester. It is difficult to determine if the student dropped out because of lack of previous academic achievement, lack of cognitive ability, lack of learning strategies, lack of motivation, life stress, high academic anxiety or some other factor. Attrition of

students is not random and, therefore, affects the results of the study.

Significance of the Study

Determining the relationships and interrelationships among various factors and the process of learning provides educators with more information about how learning occurs. Increased understanding of the process of learning provides educators with information needed to identify barriers to students' learning. Once these barriers are identified students can receive the help needed to overcome the barriers and/or to set realistic academic goals for themselves. By understanding the learning process, educators can assist students to be effective learners. This study is particularly significant for nurse educators, because assisting students to be effective learners would help reduce student attrition. A greater number of nursing students would have a positive learning experience and nursing programs would have a more effective use of limited resources.

Explanation of the Alternate Dissertation Format

This dissertation will be presented in the alternate dissertation format approved by the Graduate College at Iowa State University. The alternate format allows for

the inclusion of papers that have been or will be submitted to refereed scholarly journals for possible publication.

The first paper, "Validation of the Learning and Study Strategies Inventory with a Nursing Sample," summarizes the results of Phase 1 of the study and will be submitted to the Educational Measurement. This study provides construct related evidence concerning the usefulness of the LASSI instrument with nursing students enrolled in a two-year community college. In "Academic Achievement among Undergraduate Nursing Students: The Development and Test of a Causal Model," the results from the second phase of the study are summarized. The hypothesized relationships among variables depicted in the proposed causal learning model of academic achievement developed by the author are investigated. The results of phase two of the study will be submitted to the Journal of Nursing Education.

The Iowa State University Committee on the Use of Human Subjects in Research reviewed this project and concluded that the rights and welfare of the human subjects were adequately protected, that risks were outweighed by the potential benefits and expected value of the knowledge sought, that confidentiality of data was

assured and that informed consent was obtained by appropriate procedures.

REVIEW OF RELATED LITERATURE

Introduction

Although a comprehensive bibliography of research developed on the topic of academic achievement would include hundreds of citations, this chapter will focus on the relationship among cognitive variables, affective variables, learning strategies variables and academic achievement. In addition, models of academic achievement will be discussed.

Factors Related to Academic Achievement

Researchers have investigated a variety of factors believed to influence the academic achievement of individuals (Brown & Nelson, 1983; Bruch, Pearl & Giordano, 1986; Culler & Holahan, 1980, Desiderato & Koskinen, 1969; Doctor & Altman, 1969; Felts, 1986; Garner & Taylor, 1982; Glick, McClelland & Yang, 1986; Sarason, 1957; Hayes, 1981; Spielberger, 1966). The factors studied have included cognitive variables, such as previous academic achievement and cognitive ability; affective variables, such as motivation, life stress and anxiety; and learning strategies variables.

Cognitive variables

Several studies conducted with undergraduate nursing students have found cognitive variables to be related to academic achievement. Academic achievement has been measured by the students' nursing GPA, NLN achievement scores or NCLEX results. In a study conducted by Hayes (1981), cognitive variables were collectively found to account for 62 percent of the variance in academic achievement of undergraduate nursing students. Previous academic achievement of students has been measured by high school rank, grade point average (GPA) and course grades (Glick et al., 1986; Hayes, 1981; Kissinger & Munjas, 1982; Oliver, 1985; Selther, 1980; Sharp, 1984). Cognitive ability of students has been measured by ability tests, such as ACT or SAT (Allchnie & Bellucci's, 1981; Felts, 1986; Glick et al., 1986; Hayes, 1981; Kissinger & Munjas, 1982; Sharp, 1984; Yess, 1980). For example, Allchnie and Bellucci (1981) found high school rank to be a good predictor of academic achievement in college. Biological sciences GPA in college was identified as a good predictor by Selther (1980) and Glick et al. (1986). With regard to ACT and SAT scores, Allchnie and Bellucci (1981), Sharp (1984) and Yess (1980) found the math score to be a good predictor of

academic achievement, whereas Kissinger and Munjas (1982) found the verbal score to be a good predictor.

Affective variables

The affective variables to be discussed in this section include motivation, life stress, anxiety and self-efficacy.

Motivation Motivation is a powerfully influential concept with a wide range of interpretation. Wlodkowski (1985) points out that there are over twenty internationally recognized theories of motivation. Disagreement over the concept of motivation is due to the complexity of human behavior and the lack of concrete measures of motivation. Wlodkowski (1985) suggests using general motivation factors that incorporate beneficial strategies from a variety of motivation theories. This approach permits views of motivational strategies from classical conditioning, operant conditioning, gestalt psychology, consistency theory, rational-emotive theory and social influence theory to be used as a possible means to enhance learner motivation.

Individuals are innately motivated to take the initiative to effectively act upon their environment rather than remaining passive and allowing the environment to control their behavior (Wlodkowski, 1985).

When adults are learning and can feel an actual sense of progress and real accomplishment, they are usually well motivated and continue in the same direction. People learn more and are motivated to study with greater effort when their learning behaviors are positively reinforced by good grades, high test scores, academic awards and instructor attention. Competence fosters self-confidence, which in turn supports and motivates more extensive learning. On the other hand, motivation for learning is diminished over time when individuals feel or know their learning is coerced (Wlodkowski, 1982).

Life stress Limited research has been conducted on the effect life stress has on the learning process. de Meuse (1985), Garrity and Ries (1985), Harris (1973) and Lloyd, Alexander, Rice and Greenfield (1980) found life stress to have a significant negative effect on academic achievement. In addition, grade point average was found to be inversely related to the amount of life change recently experienced. These findings indicate that life stress may be an important variable affecting academic achievement.

An important finding of Harris (1973) is that the effect of excessive life change on grade point average tends to remain constant regardless of the level of

college readiness. College readiness was measured by the ACT and CEEB composite scores. Harris states that the results of the study imply the possibility that life change data may provide a much needed non-intellectual variable for the prediction of academic performance in college. Similarly, life stress, as measured by life change data, may be an important variable in the explanation of the learning process as demonstrated in academic achievement of students.

Test anxiety Spielberger (1972) has defined anxiety as "an unpleasant emotional state or condition which is characterized by subjective feelings of tension, apprehension, and worry, and by activation or arousal of the autonomic nervous system" (p. 482). However, the concept of anxiety has multiple aspects. Sarason (1986) has focused on the cognitive component of anxiety, suggesting that this component is relatively unambiguous and can be assessed quantitatively and reliably. Sarason (1986) states that:

> "the test-anxious person experiences self-preoccupying worry, insecurity and self-doubt in evaluative situations. These internal distractors lessen attention to the task at hand and contribute to relatively poor performance. There is growing evidence that, at least in evaluative situations, the problem of anxiety is, to a significant extent, a problem of intrusive, interfering worry-type thoughts that diminish

the attention to and efficient execution of the task at hand" (pp. 29-30).

In addition, Sarason (1983) contends that:

"test anxious people see evaluational situations as difficult, challenging, and threatening and themselves as ineffective in coping with academic challenges.... Their self-deprecating thoughts are strong and interfere with orderly problem solving" (p. 133).

It is well documented in the literature that test anxiety has a negative effect on student performance (Culler & Holahan, 1980; Hollandsworth, Glazeski, Kirkland, Jones, & Van Norman, 1979; Phillips, 1988; Spielberger, 1966). Although the reported correlations between performance and test anxiety have been moderate, Dendato and Diener (1986) contend that there is little doubt of a causal connection between the two variables. However, debates over the exact nature of this causal relationship continues as researchers explore the effect of anxiety on academic achievement.

Behavioral therapies, such as systematic desensitization, have been reported to be successful in reducing self-reported anxiety (Russel & Lent, 1982; Snyder & Deffenbacher, 1977). However, they have often failed to show an improvement in the performance measures of students (Finger & Galassi, 1977; Hollandsworth et al., 1979; Holroyd, Westbrook, Wolf & Badhorn, 1978;

Wine, 1971). This has led to a greater emphasis on the cognitive aspects of test anxiety.

The cognitive attentional model (Wine, 1971) claims that the performance of test-anxious students is impaired by "worry," negative self-evaluative statements, and task-irrelevant ruminations that compete with task-relevant activity and interfere with the recall of pertinent information. Brown and Nelson (1983) believe that high-test-anxious students tend to become negatively self-preoccupied, displaying both a greater number and a lesser degree of control of self-derogatory statements as compared to low-test-anxious students. Their findings are as follows: (1) high performers, regardless of anxiety level, reported less frequent negative thoughts than did low performers; and high anxious students, regardless of performance level, reported a greater frequency of such thought than did low anxious students; (2) high-test-anxious participants reported significantly more worry, higher levels of fear of negative evaluation and less frequent positive thought than did low-test-anxious participants; (3) students classified as high performers reported more frequent control over negative thoughts than did their less successful counterparts; (4) highly test-anxious students displayed significantly greater emotionality and a significantly

higher level of debilitating anxiety but a significantly lower level of facilitating anxiety than did low anxious students; (5) high performers have more facilitating anxiety than low performers; and (6) high performers demonstrated a greater knowledge of effective study organization. They noted that some students who were anxious about tests nonetheless perform quite adequately.

Cognitive therapies directed toward the reduction of the worry component of test anxiety have been successful in reducing self-reported anxiety (D'Alello & Murray, 1981; Goldfried, Lineman & Smith, 1979; Holroyd, 1976; Sarason, 1980; Wine, 1980), but these studies, like behavioral therapies, have not been consistent in showing improved academic performance (D'Alello & Murray, 1981; Finger & Galassi, 1977; Holroyd, 1976; McCordick, Kaplan, Finn & Smith, 1979). The inconsistent results of behavioral and cognitive therapies on academic achievement indicate the need to investigate the influence of a number variables among academic achievement as well as the interrelationship of these variables.

The findings of Sarason (1972) and Wine (1971) indicate test anxiety interferes with academic performance when students are placed in stressful situations. When students were not in a stressful

situation, few differences between high and low test anxious students were reported. Sarason (1986) suggests two possible explanations for the relationship between test anxiety and performance. One explanation is that a person with low ability becomes anxious when confronted with a situation in which the individual would fail or perform poorly. A second explanation is that anxiety prevents the student's full use of abilities in performing the designated task. Sarason notes that anxious individuals seem to employ "shallow" processing methods where as nonanxious individuals process on a "deeper" level.

Tobias (1986) and Hamilton (1975) agree with the second explanation. They contend that negative affective preoccupation must absorb some portion of the person's information processing capacity, leaving less capacity for performance on cognitive tasks. The end result is poor academic achievement by test-anxious students. Tobias (1986) purports that whether anxiety is a consequence of cognitive deficit or causes cognitive deficit is of some theoretical interest, and certainly warrants further investigation.

Because of the relatively poor records of both behavioral and cognitive therapies in improving academic performance, several researchers chose to study the

effect of study skills on students' test anxiety and performance. Culler and Holahan (1980) found that highly test-anxious students have less effective study habits than do low-anxious students. The study conducted by Kirkland and Hollandsworth (1979) indicated that students with poor academic records tend to have both inadequate study skills and high test anxiety. Brown and Nelson (1983) found that inadequate study skills and ineffective test-taking strategies had stronger negative effects on grades than did test anxiety. Research conducted by Altmaier and Woodward (1981) showed study skills training alone to be ineffective in either reducing anxiety or improving academic performance. However, Dendato and Diener (1986) and Lent and Russell (1978) found that the combination of study-skills training and systematic desensitization is effective and superior to either component alone, both in reducing anxiety and in improving academic performance.

According to Naveh-Benjamin, McKeachie and Lin (1987), there are two types of test-anxious students who can be differentiated by their study habits. One type is the test-anxious student with study skills deficiencies. This student has difficulty in encoding and organizing information. The second type is the test-anxious student with good study habits. This student can encode and

organize information, but has difficulty in retrieving the information in evaluative situations. It is anticipated that the problem could be due to worry about his/her ability and performance.

Self-efficacy Increased evidence suggests that students' achievement expectancies affect their academic performance (Bandura, 1982; Weiner, 1980). Bandura (1978, 1982) refers to students' achievement expectations or self competence as self-efficacy. Schunk (1983) defines self-efficacy as people's personal judgment of how well they can use the abilities they possess. Individuals' feelings of self-efficacy are influenced by information gained from self-performance, vicarious experiences, verbal persuasion and physiological indices (Bandura, 1982).

Self-performance is believed to be the most influential source of self-efficacy information. Successful performances heighten perceived self-efficacy, whereas repeated failures lower it. Individuals' feelings of self-efficacy are partially influenced by vicarious experiences. Efficacy expectation can be raised by observing others successfully perform tasks that individuals judge themselves capable of performing. Verbal persuasion is used to get people to believe they

possess the capabilities needed to achieve a task. Although social persuasion has limited power in creating enduring increases in self-efficacy, its boost in feelings of self-efficacy can result in increased efforts to succeed. People's judgment of capabilities is partly dependent on their physiologic state. Visceral arousal in stressful situations is viewed as an ominous sign and results in expectations of failure. People who view themselves inefficacious dwell on their personal deficiencies and imagine potential difficulties to be greater than they are. The end result is impaired performance. When individuals are not confronted with anxiety and aversive arousal, success is expected. The higher individuals' level of perceived self-efficacy, the greater their performance accomplishments (Bandura, 1982).

Learning Strategies Variables

Learning strategies is a very broad term that encompasses a number of different competencies needed for effective learning and retention of information. Dansereau (1985) states that students use primary and support strategies for effective learning. Primary strategies, such as paraphrasing, imagery and networking, are used to acquire, store and retrieve information.

Support strategies, such as planning, scheduling and concentrating, are used to maintain a suitable state of mind for learning. Dansereau (1985) points out that "regardless of the effectiveness of the primary strategies, their impact on performance will be less than optimal if the psychological state of the student is not optimal" (p. 224).

Weinstein and Underwood (1985) hold that learning strategies consist of cognitive information-processing strategies, active study strategies, support strategies and metacognitive strategies. Cognitive information-processing strategies include techniques for organizing and elaborating on incoming information to make it meaningful. Active study strategies involve systems for note-taking and test preparation. Support strategies are techniques for organizing study time, coping with performance anxiety, and directing attention to the task on hand. Metacognition refers to learners' ability to detect discrepancies between what they know and what they do not know and to monitor and direct their acquisition of the new information.

Weinstein and Rogers (1985) see comprehensive monitoring as an active learning strategy necessary for success in any learning situation. Comprehension monitoring refers to an individual's ability to establish

goals, assess the degree to which these goals are being met and to modify the strategies being used, if necessary, to more closely meet the goals (Weinstein & Rogers, 1985). Researchers have suggested that one important difference between children who are good and poor readers is that poor readers lack effective comprehension monitoring strategies (Garner & Taylor, 1982; Golinkoff, 1976; Hare & Smith, 1982; Myers & Paris, 1978). Baker (1979) and Weinstein & Rogers (1985) found that college students' monitoring skills are also deficient in such strategies.

Weinstein and Rogers (1985) believe that teachers are very often much more active in the learning process than are the students. They believe that successful students learn to adopt active strategies for learning by incorporating monitoring behaviors into their repertoire of learning skills. Weinstein and Rogers propose that this is perhaps the reason why students encounter difficulty in college where most professors presume students to be independent learners. They also believe that passive learners can be trained to acquire comprehension monitoring behaviors. Reading comprehension of students was found to be improved after instruction in comprehension monitoring (Weinstein & Rogers, 1985).

Recent research has demonstrated that instructing individuals in the use of learning strategies is one way to influence the manner in which individuals process new information and skills (Biggs, 1984; Bliss & Mueller, 1987; Dansereau, Brooks, Holley, & Collins, 1983; Dansereau, Collins, McDonald, Holley, Garland, Diekhoff & Evans, 1984; Foster & Leung, 1985; Jones, Amiran & Katims, 1984; McCombs, 1981; Nisbet & Schucksmith, 1986; Orantes, 1985; Weinstein & Mayer, 1986; Weinstein & Underwood, 1985). For example, a study conducted by Miller, Alway and McKinley (1987) suggests a link between learning processes and academic achievement. They found that measures of deep processing (studying that focuses on the connection of facts and not the simple memorization of facts), in combination with ACT scores, nearly doubled the variance in grade point averages that could be accounted for by ACT scores alone. The results of Cook and Mayer's study (1988) suggest that students be taught comprehension strategies specifically tailored to the specific domain of learning and the type of text used for that domain.

One instrument developed to assess information processing of individuals is the Inventory of Learning Processes (Schmeck, 1983). The underlying framework of this instrument is levels of information processing,

consisting of four subscales - 1) deep processing, 2) elaborative processing, 3) fact retention and 4) methodological study. However, the instrument does not address the individuals' intention and motivation regarding learning.

Entwistle and Ramsden (1983) developed an instrument entitled, Approaches to Studying Inventory to assess students' approaches to learning. The three approaches consist of deep approach, surface approach and strategic approach. With a deep approach to learning students' intent is to understand the information. Studying with the intent to reproduce information is the surface approach. Students seeking to maximize grades by strategic management of their time and intellectual resources is referred to as a strategic approach.

Assessment of learning strategies

The majority of instruments for assessing learning strategies focus on the individual's study practices. These instruments are generally used in high school or college settings. Learning strategies tools are used to predict academic performance, to counsel students concerning their study practice, and to screen for study skills courses.

Schulte and Weinstein (1981) reviewed the available commercial study skills instruments and found that the instruments covered traditional areas of study skills - note taking, time management, work habits and student attitudes toward school and study. The reliabilities of the instruments were generally found to be in the acceptable range of .80 and above. The subscales were found to have lower reliabilities (.46 to .93), partially due to their shorter length. These instruments predict grade-point average from a low to moderate degree (r=.19 to .60). After reviewing the available learning strategies instruments Schulte and Weinstein (1981) arrived at the following conclusions:

(1) There is no consistent definition of study skills.

(2) The reliability of the subscales is often so low that the subscales cannot be used separately.

(3) Most of the recommended or "good" study skills instruments have not been empirically validated.

(4) No study skill instrument has been validated for use as a diagnostic instrument.

(5) Most of the study skills instruments can be

easily faked.

(6) Recent research has suggested that there are two components of effective study - consistent and regular study and an "active" learning style. Most items in published study skills inventories deal primarily with only the first component.

The Cognitive Learning Strategies Project was established to develop an instrument to overcome the problems stated above. The instrument was to be designed to help educators and trainers diagnose strengths and weaknesses in students' learning and study strategies in order to provide remedial training. Weinstein, Zimmermann, and Palmer (1985) recognized that to accomplish this goal an instrument is needed that:

> "(a) assesses a broad range of topics within the area of learning strategies in a reliable and valid manner, (b) assess covert and overt behavior that are related to learning and that could be altered through training, (c) reflects the current state of the art in learning strategy research and cognitive psychology, and d) is validated for use as a diagnostic instrument" (p. 706).

The project resulted in the development of the Learning and Study Strategies Inventory (LASSI) (Weinstein, 1987). The initial phase of project involved the creation of a categorization scheme for the various study skills and

learning strategies (Weinstein, Zimmermann & Palmer, 1985). The topics of forty-seven study skills books, manuals and program guides were collected. Four judges used a modified Delphi technique to obtain consensus on 19 general categories for the instrument. The expert judges sorted the 645 potential items into the 19 general categories. It was identified that many items were duplicate or close duplicates of other items and a number of items fit in more than one category.

The problem of items fitting in more than one category was addressed in the pilot testing. The testing resulted in the revision of the categories. Items were eliminated if they were duplicates, did not deal directly with study practices (e.g., items about personality characteristics) or were concerned with an aspect of study or previous behavior and experience that could not be altered and targeted for remediation. Poorly worded items were rewritten by specialists in tests and measurement. This process reduced the number of potential pool items to 291. The items were converted into a forced-choice mode using true-false format and randomly divided into three sets, containing 97 items each. Pilot subjects were requested to complete one of the three instruments (Weinstein, Zimmermann & Palmer, 1985).

Being a self-report instrument, social-desirability response set can be a major problem. To obtain data about the relationship between responses to individual items and the degree to which subjects displayed a social-desirability response set, the subjects were requested to complete the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1964). Potential LASSI items were eliminated if they had significant positive or negative correlations with the measure of social desirability (Weinstein, Zimmermann & Palmer, 1985).

The following criteria were established for eliminating items from the pool after piloting of the instrument:

> "1. The item's correlation with the Marlowe-Crowne Social-Desirability Scale was above .50.
>
> 2. The item's correlation with cumulative GPA was not significant at the .10 level.
>
> 3. The content of the item dealt with an area that was more conveniently measured in a reliable or valid manner by an objective or performance assessment. (Based on this criteria a small number of items dealing with vocabulary and library skills were eliminated.)" (p. 709)

Items were added to the pool based on students' responses on the post-experimental questionnaire, students's responses to an open-ended questionnaire, survey of current research literature in cognitive

psychology, and suggestions from practitioners (Weinstein, Wicker, Cubberly, Roney & Underwood, 1980). Data from the post-experimental questionnaire indicated that students were uncomfortable with the two-point forced-choice format of true/false. After consulting two psychometricians, it was decided to reformat the scale into a five-point Likert-type format. Three expert judges recategorized the new set of potential LASSI items, resulting in 14 general categories. Randomly selected items were reworded to obtain an approximately equal distribution of positively and negatively worded statements. The items were then randomly ordered with the constraint that two similar items from the same category did not appear consecutively (Weinstein, Zimmermann & Palmer, 1985). This new pool of 149 items was examined independently by two content matter specialists and two psychometricians (Weinstein, 1987).

A second pilot test was conducted to evaluate the administration procedures and to examine the properties of the items as a large number of revisions occurred after the preliminary pilot test. A new set of item selection criteria was established for the field test version. Items were eliminated if they met any of the following criteria:

"1. If two items from the same category had highly similar wording and highly similar response patterns, one of the items was eliminated.

2. The item dealt with a very specialized skill, such as creating a bibliography for a term paper (three items were eliminated using this criteria).

3. Responses to the item were limited to one or two contiguous points on the scale." (p. 711)

This version of the LASSI had 130 items. A preliminary study of test-retest reliability was conducted using a 3 to 4-week interval. A test-retest correlation of .88 was computed for the total instrument. Field tests were conducted over a 2-year period, resulting in the number of items being reduced to 90 and in the development of 10 scales measuring cluster of learning strategies, study skills and attitudes (Weinstein, 1987).

A team of experts grouped the items according to a particular theme or factor. This process was repeated several times. Following this process, the groupings were refined by adding and deleting items to obtain a maximum coefficient alpha for each scale (Weinstein,

Zimmermann & Palmer, 1985). In 1984 the scales were refined and thirty new items were created and added prior to another large-scale field test. The current 77-item form of the LASSI was created by an item analysis of the data. A sample of 880 incoming freshman from a large southern university was used to develop norms. Test-retest correlations, using a 3-week interval were computed on a sample of 209 students from an introductory course in communication at the same school (Weinstein, 1987). The coefficient alphas and test-retest correlation coefficients for the ten scales were reported by Weinstein (1987) as follows:

Coefficient	Coefficient Alpha	Test-Retest Correlation
Attitude	.72	.75
Motivation	.81	.84
Time Management	.86	.85
Anxiety	.81	.83
Concentration	.84	.85
Information Processing	.83	.72
Selecting Main Ideas	.74	.78
Study Aids	.68	.75
Self Testing	.75	.78
Test Strategies	.83	.81

Correlations among the scales are not reported in the manual. With regard to validity, it is stated in the manual that "the LASSI has been subjected to repeated user validity" (p. 5). However, the test developers do not report empirical construct validaty data.

Models of Academic Performance

A considerable amount of research has focused on student dropout from higher education. Tinto (1975) reviewed research related to student dropout and developed a theoretical model of dropout behavior. He contends that the individual's integration into the academic and social systems of the college directly relates to one's continuance in that college. He points out that minimal levels of academic and/or social integration might not lead to dropout from the institution if there is sufficiently high commitment to the goal of college completion. A student's own ability is viewed as being more important than family background in determining one's educational performance. An important predictor of future college performance is performance in high school, measured by grade point average or rank in class. Goal commitment is placed after family background and prior to educational experiences in the model, suggesting one's commitment is a multidimensional process of interactions among the individual, one's family and prior experiences in schooling.

A distinction is made between academic dismissal and voluntary withdrawal. Withdrawal appears to be related to the lack of congruency between the individual and both

the intellectual climate of the institution and the social system composed of peers. Academic dismissals appear to result from the inability to meet the intellectual and social demands of the college or from being so integrated into the social system of the college that academic demands go unmet.

Research conducted by Munro (1981) supports Tinto's view that goal commitment has the strongest effect on persistence in higher education. Academic integration was found to have a strong effect on persistence, but social integration was found to have no significant effect. Self-esteem was found to be a stronger predictor of consequent variables in the model than locus of control. Fourteen percent of the variance in withdrawal behavior was found to be explained by the model.

Pascarella and Chapman (1983) investigated the validity of Tinto's model of college withdrawal in three different types of institutions - 1) 4-year, primarily residential colleges, 2) 4-year, primarily commuter colleges and 3) 2-year, primarily commuter colleges. Four discriminant analyses were conducted to examine the interrelationships of student background, institutional characteristics, academic integration, social integration, goal commitment, institutional commitment and persistence in college. A pooled analysis supported

a number of Tinto's theoretical expectations. However, variations were found when the data were divided into the three different types of institutions. Institutional commitment had a much stronger direct effect than goal commitment in the 4-year residential and 4-year commuter institutions, while goal commitment had a somewhat stronger direct effect than institutional commitment in the 2-year commuter institutions. In both 2-year and 4-year commuter colleges, academic integration had stronger indirect effects on persistence than did social integration.

One academic performance model found in the literature was the Biggs' model (1984). It consists of three sets of variables - independent, intervening and dependent. The independent variables are classified as personalogical or situational. Personalogical refers to an individual's abilities, processes, cognitive style, personality and prior knowledge. Situational refers to the nature, content, difficulty, presentation, and evaluation of the task. The intervening variables consist of macrostrategies (ordering and relating data), mesostrategy (learning styles and study strategies), microstrategies (transferring knowledge across different tasks of the same kind) and affective variable (motivation, values and beliefs in self-efficacy). The

data were analyzied using correlations and three-way ANOVAs. Results of the study provided support for the view that students use learning and study strategies that are congruent with their motives for learning.

After reviewing the literature on models relating academic achievement to cognitive abilities, motivation, anxiety, study skills and learning strategies, it is clear that continued research is needed to identify which variables play an important role in the academic achievement of students. Path analyses have been conducted to examine the interrelationships among variables with regard to student dropout in higher education. A limitation is that many of these studies have focused only on 4-year residential institutions. Similar research needs to be conducted in 2-year commuter institutions. A specific concern of this researcher is the interrelationship among variables with regard to the academic achievement of nursing students.

SECTION I.

VALIDATION OF THE LEARNING AND STUDY STRATEGIES INVENTORY WITH A NURSING SAMPLE

VALIDATION OF THE LEARNING AND STUDY STRATEGIES INVENTORY WITH A NURSING SAMPLE

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ABSTRACT

This paper examines the validity of the 77-item Learning and Study Skills Inventory (LASSI) with 134 first semester nursing students enrolled in a two-year community college. Although 10 subscales have been identified in previous research, factor analysis of the LASSI data obtained from the current subjects resulted in four reliable subscales. Subscale I, self-monitoring/use of study strategies, is comprised of 18 items and addresses uses of study aids, information processing and self-testing. Subscale II, self-efficacy, consists of 19 items and is a combination of items addressing academic anxiety, test strategies and selecting main ideas. A combination of 22 items addressing attention and time management form Subscale III, titled concentration/ preparation for class. Sixteen items related to attitude and motivation are combined to form Subscale IV, motivation. Results suggest that educators could best assist adult learners by encouraging the development of feelings of self-efficacy and skills of concentration, preparation for class, study strategies and self-monitoring.

Key Concepts

Instrument validation - LASSI and nursing population, learning strategies, study skills and habits.

VALIDATION OF THE LEARNING AND STUDY STRATEGIES INVENTORY WITH A NURSING SAMPLE

Increased understanding of the process of learning provides educators with information needed to identify barriers to students' learning and to set realistic academic goals. By understanding the learning process educators can assist students to be effective learners. Effective learners are individuals who actively process, interpret and synthesize information, using a variety of different strategies to store and retrieve information (Wittrock, 1974; 1978). The strategies used for effective learning and retention of information are known as learning strategies (Nisbet & Schucksmith, 1986; Weinstein & Underwood, 1985).

Learning strategies is a very broad term that encompasses a number of different competencies needed for effective learning and retention of information. Dansereau (1985) states that students use primary and support strategies for effective learning. Primary strategies, such as paraphrasing, imagery and networking, are used to acquire, store and retrieve information. Support strategies, such as planning, scheduling and concentrating, are used to maintain a suitable state of mind for learning. Dansereau (1985) points out that

"regardless of the effectiveness of the primary strategies, their impact and performance will be less than optimal if the psychological state of the student is not optimal" (p. 224).

Weinstein and Underwood (1985) hold that learning strategies consist of cognitive information-processing strategies, active study strategies, support strategies and metacognitive strategies. Cognitive information-processing strategies include techniques for organizing and elaborating on incoming information to make it meaningful. Active study strategies involve systems for note-taking and test preparation. Support strategies are techniques for organizing study time, coping with performance anxiety, and directing attention to the task on hand. Metacognition refers to learners' ability to detect discrepancies between what they know and what they do not know and to monitor and direct their acquisition of the new information.

Several instruments are available commercially to measure students' study skills, such as note taking, time management, work habits and attitudes toward school and study (e.g., California Study Methods Survey; Carter, 1958; College Adjustment and Study Skills Inventory; Christensen, 1968; and Survey of Study Habits and Attitudes; Brown & Holtzman, 1953). However, Weinstein,

Zimmermann and Palmer (1985) conclude that available commercial study skills instruments generally lack desirable psychometric properties. They assert that most of the recommended or "good" study skills instruments have not been empirically validated. Further, no study skill instrument has been validated for use as a diagnostic instrument at the time of their review of available instruments. There is no consistent definition of study skills and most of the study skills instruments can be easily faked. In addition, the reliability of the subscales is often so low that the subscales cannot be used separately.

The Learning and Study Skills Inventory (LASSI) (Weinstein, Schulte & Palmer, 1987) was presented as a diagnostic measure 1) to assess the study habits and "active" learning of individuals, 2) to assist in planning individual prescriptions for remediation and enrichment and 3) to be used as a counseling tool with individuals for college orientation programs, developmental education programs, learning assistance programs and learning centers. The norm group consisted of 880 incoming freshmen at a southern university.

The LASSI (Weinstein, Schulte & Palmer, 1987) is a self-report instrument consisting of 77 items written in a Likert scale format. The test is comprised of ten

subscales - 1) study aids, 2) select main ideas, 3) information processing, 4) self-testing, 5) test strategies, 6) attitude, 7) motivation, 8) academic anxiety, 9) concentration and 10) time management. After reading each item the student responds if the statement is not at all typical of him/her (1), not very typical of him/her (2), somewhat typical of him/her (3), fairly typical of him/her (4) or very much typical of him/her (5). Some items are stated in a positive direction and others are stated in a negative direction. In the current study, all negatively stated items were recoded so all scales were scored in the positive direction.

The LASSI is a relatively new instrument with limited validity data (Weinstein, 1987). Construct validation has consisted primarily of obtaining the judgments of experts. A multistage process involving the judgment of small groups of three or four persons was used. This limited number of experts may have resulted in shared bias in the development of the LASSI. To be useful to educators and academic advisors, more empirical data are needed to provide evidence of the validity of the LASSI with entering college students in two-year and four-year institutions. The purpose of this study is to provide data regarding the construct validity and internal consistency of the LASSI for use with nursing

students who are adult learners enrolled in a two-year community college.

Methodology

Subjects

The subjects of this study were 134 first-year nursing students (88%) enrolled at a Midwestern community college during the 1988-89 academic year. This is a multicampus college with a nursing program provided at three of the four campuses. Seventy-one of the subjects are from the main campus, 39 and 24 from the other two campuses. Ninety-seven percent of the students are females. Most of the subjects are adult learners, i.e., 68% of the nursing students are over 24 years of age (mean = 29, median = 27). Forty-four percent of the subjects are married, 35% are single and 21% are separated or divorced. It should be noted that single subjects include both students with and without children. Over one-third of the subjects work more than 20 hours per week.

Instrumentation

According to Weinstein (1987) the LASSI provides ten separate subscales measuring learning strategies of students. A list of the ten scales with a description of each follows.

Study aids - techniques or materials used to help the student learn and remember new information, such as headings, special types, special markings, summaries and statements of objectives (Weinstein, 1987).

Select main ideas - ability to "pick out important information for further study" (Weinstein, 1987, p. 3).

Information processing - techniques used to organize and to elaborate on incoming information, making it more meaningful (Weinstein & Underwood, 1985).

Self testing - comprehensive monitoring in which the student assesses the degree to which learning has occurred and, if necessary, modify strategies being used to achieve learning goals (Weinstein & Mayer, 1986; Weinstein & Rogers, 1985).

Test strategies - approaches used to prepare for and take examinations (Weinstein, 1987).

Attitude - interest in college and general

motivation for succeeding in school (Weinstein, 1987).

Motivation - individual's "diligence, self-discipline and willingness to work hard" (Weinstein, 1987, p. 2) in order to learn and achieve.

Academic anxiety - worries about school and performance in school (Weinstein, 1987).

Concentration - paying close attention to academic tasks (Weinstein, 1987).

Time management - organizes and systematically plans for use of time; uses time to the best advantage (Weinstein, Zimmermann & Palmer 1985).

Each scale contains eight items, with a possible score range of eight to 40 with the exception of the Select Main Ideas scale. It contains five items and has a possible range of five to 25. The manual (Weinstein, 1987) reports that coefficient alphas for the ten LASSI scales ranged from .68 to .86 and the test-retest correlation coefficients ranged from .72 to .85. No information regarding the correlations among the ten

scales is provided in the manual. With regard to validity the manual states that "the LASSI has been subjected to repeated tests of user validity" (Weinstein, 1987, p. 5). It goes on to state that professors, advisors, developmental educators, counselors and learning center specialists in more that 30 college and universities have found a high degree of usefulness of the LASSI in their setting.

Procedures

The LASSI was administered to the subjects between the fourth and sixth week of the semester during Fall 1988. Permission was obtained from the subjects prior to the administration of the instrument. The instrument was administered during class time and required approximately 15-20 minutes to complete.

Data analyses

Pearson correlations were computed to examine the interrelationships of the ten LASSI scales. The individual's mean for the scale was substituted for the missing items. Further Pearson correlations were computed based on the scales resulting from the factor analyses.

Principal component factor analysis was conducted to examine the construct validity of the LASSI. Data were

missing for 13 of the 10,318 items completed by the subjects as a group. Oblimin rotation was used and the number of factors was set at ten, the number of subscales in the LASSI instrument. Successive analyses were conducted with the number of factors set at two through nine to determine the best representation of the data.

Reliabilities of the scales derived from the factor analyses were determined by examining the internal consistency estimates as computed by Cronbach's alpha.

Results

The correlation coefficients and the reliability estimates are reported in Table 1. The correlation coefficients indicate moderate interrelationships among the subscales. The alpha coefficients of the sample ranged from 0.59 to 0.86 and are comparable to the alpha coefficients reported in the LASSI manual (Weinstein, 1987).

The factor analysis, with the number of factors set at ten, failed to converge to form a rotated factor matrix. Additional factor analyses were conducted with the number of factors set at 9, 8, 7, 6, 5, 4, 3 and 2. A rotated factor matrix was formed for each of these factor analyses. The criterion of eigenvalues being greater than one was used in determining the number of

significant factors (Kaiser, 1958). The significant factors in each factor matrix were examined to determine the best representation of the data. The authors were best able to interpret a pattern and to assign meaning to the factors when four factors were extracted. The eigenvalue after rotation and percent of variance for the factors are as follows: Subscale 1, 15.04 and 19.5; Subscale 2, 6.89 and 8.9; Subscale 3, 3.70 and 4.8 and Subscale 4, 2.77 and 3.6. The total amount of variance accounted for by the four subscales was 36.8%. The factor loading of each item was examined and any item with a factor loading below $\pm$.30 was eliminated. This resulted in the deletion of two items - "I memorize grammatical rules, technical terms, formulas, etc., without understanding them" and "When they are available, I attend group review sessions." When an item loaded on more than one factor, the item was chosen for the factor with the highest loading.

The mean, standard deviation and range for each of the four subscales are reported in Table 2. The intercorrelations among the four subscales are reported in Table 3. The subjects' motivation scores were high indicating that it was fairly typical of the subjects to be motivated in their academic studies. The lowest motivation score was 2.44 and the highest score was a

5.00. The behaviors being measured by the other three scales were found to be somewhat typical of the subjects. A wider range of scores was found for each of three subscales. Reliabilities for the four subscales were determined by examining the internal consistency estimates as computed by Cronbach's alpha. The reliability estimates for Subscales 1, 2, 3 and 4 are .86, .88, .91 and .80, respectively. A listing of each item with its factor loading for each of the four subscales is presented in Tables 4, 5, 6 and 7.

Subscale 1 (see Table 4) consists of 18 items and includes seven LASSI items from the information processing scale, four items from the self-testing scale and five items from the study aids scale. Two items from the other scales were included.

Nineteen items form Subscale 2 (see Table 5). It is a combination of the LASSI scales of academic anxiety, testing strategies and selecting main ideas. All eight of the LASSI's anxiety items, six of the testing strategies items, three select main ideas items, one study aid item and one attitude item comprise Factor I.

Subscale 3 (see Table 6) consists of twenty-two itmes. It includes five items from the concentration scale, all eight of the time management items, six motivation items and three self-testing items.

Sixteen items form Subscale 4 (see Table 7). It consists of seven attitude items, three concentration items and one motivation item. The remaining five items were from other scales.

Discussion

The results of this study indicate that when the LASSI is used with adult learners enrolled in a two-year nursing program, four useful subscales can be identified instead of the ten intended by the authors. Regrouping of LASSI items is supported by Mealey (1988), who contends in a review of the instrument that "in some instances, items belonging to one subscale could be included in another" (p.383).

On the first subscale, the primary loadings were from the LASSI subscales of information processing, self-testing and study aids. Factor 1 is entitled self-monitoring/use of study strategies. Employing study strategies by itself will not result in successful academic achievement. An individual must also monitor the effectiveness of one's study strategies by the use of self-monitoring. "I try to interrelate themes in what I am studying" is one example of a study strategies item. An example of a self-monitoring item is "When preparing for an exam, I create questions that I think might be

included." Review of the study aids items reveals that these items are appropriately included in this factor because the use of study aids is one example of a study strategy technique. An example of a study aid item used as a study strategy is "I make drawings or sketches to help me understand what I am studying." Although study strategies are fully represented by several items in Factor 1, self-monitoring is minimally represented (See items 17, 21, 30 and 70 in Table 4). These items discuss the use of techniques for self-testing, but they do not measure self-evaluation to determine if learning goals and objectives have been obtained. To adequately assess the homogeneity of study strategy items and self-monitoring items, additional self-monitoring items may need to be developed and tested for Subscale 1.

The primary loadings for Subscale 2 were from the LASSI subscales of anxiety, testing strategies and selecting main ideas. One example of an anxiety item is "I am very tense when I study." The term testing strategies includes preparing for examinations and taking examinations. One example of a testing preparation item is "When I take a test, I realize I have studied the wrong material." An example of an item for taking examinations is "I have trouble understanding just what a test question is asking." "I am able to distinguish

between more important and less important information during a lecture" is an example of a select main ideas item. The literature indicates that students who do not know how to prepare for and/or how to take examinations will experience increased anxiety and worry about academic performance (Brown & Nelson, 1983; Culler & Holahan, 1980; Flavell, 1979; Kirkland & Hollandsworth, 1979). This supports the grouping of anxiety and test strategies together to form Subscale 3. Selecting main ideas items are sensibly included in this factor because selecting main ideas is one of several approaches used to prepare for examinations.

In reviewing the items, Subscale 2 appears to represent self-efficacy. Bandura (1982) defines self-efficacy as personal judgments about how well one can execute courses of action required to handle particular situations. Here, the particular situation of concern is academic endeavors. Palmer and Goetz (1988) describe efficacy expectations as "the belief that one can successfully execute behaviors that produce desired outcomes" (p. 50). The desired outcome in this situation is academic achievement. Self-efficacy is also simply referred to as one's perception of self competence (Palmer & Goetz, 1988; McCombs, 1988).

Self-efficacy appears to be a better term than testing strategies and selecting main ideas to describe the domain measured in Subscale 2. The testing strategies items (See items 20, 34, 52, 71 and 75 in Table 5) reflect an individual's belief in being able to perform tasks needed to be academically successful. An individual's perception of being academically successful (self-efficacy) could be influenced by one's ability to select main ideas (See items 2, 72 and 77 in Table 5). This view is supported by Reynolds and Shirey (1988) who assert that effective use of any traditional study strategy for academic achievement requires the ability to differentiate important from unimportant information.

The theory of self-efficacy provides an alternative way of looking at anxiety. Perceptions of self-efficacy affect an individual's reactions, especially anxiety and stress reduction, to unfamiliar or potentially aversive events. Bandura (1982) found that the "less efficacious subjects' perceived themselves to be, the more fear [anxiety] they experience" (p. 138). This finding supports the grouping of anxiety and self-efficacy items together in Subscale 2. One would anticipate that an individual with high self-efficacy would experience low academic anxiety.

Concentration/preparation for class is the label assigned to Subscale 3. Concentration/preparation for class refers to an individual's focus on academic tasks and use of time management principles to complete class assignments and to prepare for examinations. The grouping of concentration and time management together is conceptually logical, as students, who have difficulty concentrating, will frequently experience poor time management also. The items loading on Subscale 3 were primarily the concentration and time management items of the LASSI (see Table 6). An example of a concentration item is "My mind wanders a lot when I study." "I put off studying more than I should" is an example of a time management item.

Subscale 3 also includes six items from the motivation scale of the LASSI (See items 10, 13, 16, 28, 33 and 58 in Table 6). In analyzing these motivation items, it becomes clear that these particular items deal with concentration or time management issues. Examples of motivation items that have been grouped with time management and concentration are "I come to class unprepared" and "I am up-to-date in my class assignments."

Motivation is the label assigned to Subscale 4. The term motivation is used broadly to include Weinstein's

(1987) definition of attitude - "general attitude and motivation for succeeding in school" (p. 6). An example of an attitude item is "In my opinion, what is taught in my courses is not worth learning." A motivation item included in this factor is "When work is difficult I either give up or study only the easy parts." Three concentration items are included in this factor (e.g., "I find it hard to pay attention during lectures"). It could be argued that these particular items measure lack of motivation instead of the lack of concentration. In general, Subscale 4 measures one's desire to learn and one's commitment to learning.

The finding of four subscales instead of ten for the LASSI data with undergraduate nursing students may be due to the conceptual overlap and redundancy of the subscales in the instrument. The concepts underlying the subscales of the LASSI are closely related, making it difficult to clearly distinguish among the ten subscales.
Self-efficacy is a broad concept that incorporates the LASSI subscales of select main ideas, test strategies and academic anxiety. Self-efficacy reflects individuals' perceptions of their ability to select main ideas in information to be learned and to use strategies to prepare for examinations. If students lack these

abilities they would experience anxiety, resulting in feelings of inefficacy.

It is also logical that the subscales for concentration and time management are grouped together. If students are not able to concentrate and use their time efficiently to focus on their studies, one would anticipate that these individuals would not be prepared for class. Similarly, learning does not occur with the mere possession of study strategies. Individuals need to use study aids to assist information processing as well as to self-test in order to be an effective learner. Finally, motivation and attitude are two concepts that are closely related. When addressing the academic achievement of students, differences between the concepts of motivation and attitude may narrow.

Another reason for identifying four subscales instead of recognizing the established ten may be the nature of the population studied. Adult learners may be more mature with regard to the affective characteristics being measured. As adult learners, they may have clearly set goals and thus their level of motivation to succeed may be in harmony with their general attitudes toward learning. In addition, their study strategies have probably developed and stabalized over the numerous years of educational experiences, resulting in integrated

patterns. This suggests that a separate construct may be required to address the learning process of adult learners.

A limitation of this study is the narrow focus on a nursing sample. This indicates the need for additional construct validation studies of the LASSI instrument with other nursing samples as well as a variety of other disciplines. Further validation studies might focus on subjects who are directly entering college from high school and those who are adult learners. Special emphasis should be placed on the latter, because the mean age of college students has been increasing. The setting of this study was a community college. Validation studies should be conducted with subjects from a variety of educational settings, as students from different educational institutions may differ. In general, there is a need to continue to focus on the development of valid and reliable instruments to measure the learning process of students.

The results of this study indicate that the variables influencing the learning process are highly interrelated and overlap. Researchers should focus on the basic work of identifying variables that comprise the learning process and continue to work on refining the definition of these variables to obtain clear and

distinct variables. The results of this study and a subsequent (Chacko & Huba, 1989, Section II, herein) suggest that educators could best assist students in their academic endeavors by 1) enhancing the students' feelings of self-efficacy, 2) encouraging students to concentrate on their studies and come to class prepared 3) assisting students in refining and using study strategies and self-monitoring skills, and 4) enhancing students' motivation. Although it was found that adult learners had high scores in the area of motivation, indicating strong goal commitment, it is important for educators to provide a curriculum that continues to motivate students. In a subsequent study it was found that the four subscales identified in this study were related to academic achievement of undergraduate nursing students (Chacko & Huba, 1989, Section II, herein).

Table 1. Internal consistency estimates for and correlation coefficients among the Learning And Study Strategy Inventory (LASSI) scales

LASSI Scales	Correlation coefficients									
	ATT	MOT	TMT	ANX	CON	INP	SMI	STA	SFT	TST
ATT(Attitude)	.66 (.72)	.53	.43	.26	.55	.48	.51	.40	.38	.41
MOT(Motivation)		.81 (.81)	.71	.14	.57	.52	.38	.49	.60	.34
TMT(Time Management)			.81 (.86)	.16	.60	.33	.24	.43	.54	.34
ANX(Anxiety)				.86 (.81)	.45	.22	.53	-.01	-.03	.55
CON(Concentration)					.78 (.84)	.42	.37	.29	.43	.49
INP(Information Processing)						.82 (.83)	.54	.50	.55	.38
SMI(Selecting Main Ideas)							.74 (.74)	.30	.20	.69
STA(Study Aids)								.59 (.68)	.56	.15
SFT(Self Testing)									.76 (.76)	.19
TST(Test Strategies)										.78 (.83)

Note. The diagonal coefficients are the alpha estimates for the sample and the normative group, with the normative group in parentheses. $p<.05$ for $r \geq .19$ (df=133).

Table 2. Means, medians, standard deviations and ranges of four subscales of Learning and Study Strategy Inventory (LASSI)

LASSI Subscale	Mean	Median	S.D.	Rangea
Self-monitoring/use of study strategies	3.52	3.47	.55	1.78-5.00
Self-efficacy	3.41	3.53	.62	1.58-4.58
Concentration/ preparation for class	3.40	3.36	.61	1.45-4.77
Motivation	4.18	4.25	.44	2.44-5.00

[a]Each total scale score was divided by the number of items in the respective subscale, resulting in a possible range of 1-5 for each scale.

Table 3. Intercorrelations among the four subscales of Learning and Study Strategies Inventory (LASSI)

	SE	C/P	M
Self-monitoring/use of study strategies (SM/USS)	.309	.597	.555
Self-efficacy (SE)		.330	.463
Concentration/preparation for class (C/P)			.485
Motivation (M)			

Table 4. Factor loadings and LASSI items for Subscale 1-Self-monitoring/use of study strategies

Factor loading	LASSI Item	
.61294	23.	I translate what I am studying into my own words.
.58068	76.	I try to interrelate themes in what I am studying.
.56488	8.	I try to identify the main points when I listen to lectures.
.54882	67.	I try to see how what I am studying would apply to my everyday living.
.54177a	32.	When I am studying a topic I try to make everything fit together logically.
.53403	30.	I stop periodically while reading and mentally go over or review what was said.
.53131	50.	I make drawings or sketches to help me understand what I am studying.
.51143	21.	I try to identify potential test questions when reviewing my class material.
.48905	7.	I use special study helps, such as italics and headings, that are in my textbook.
.46777	12.	I try to think through a topic and decide what I am supposed to learn from it rather than just read it over when studying.
.45173	17.	When preparing for an exam, I create questions that I think might be included.
.44853	53.	I make simple charts, diagrams, or tables to summarize material in my courses.

.41970[b]	44.	I key in on the first and/or last sentences of most paragraphs when reading my text.
.41382[c]	47.	I try to relate what I am studying to my own experiences.
.40085	15.	I learn new words or ideas by visualizing a situation in which they occur.
.39531[d]	70.	I go over homework assignments when reviewing class materials.
.35226	62.	I use the chapter headings as a guide to identify important points in my reading.
.30690	41.	I set high standards for myself in school.

[a]Loaded .31459 on Factor 4.
[b]Loaded .32687 on Factor 4.
[c]Loaded .30698 on Factor 4.
[d]Loaded .35933 on Factor 3.

Table 5. Factor loadings and LASSI items for Subscale 2-Self-efficacy

Factor loading	LASSI Item	
.81289	57.	I feel very panicky when I take an important test.
.75601	63.	I get so nervous and confused when taking an examination that I fail to answer questions to the best of my ability.
.69162	54.	Worrying about doing poorly interferes with my concentration on tests.
.67143	31.	Even when I am well prepared for a test, I feel very anxious.
.63532	25.	I am very tense when I study.
.63507	1.	I worry that I will flunk out of school.
.61174	75.	In taking tests, writing themes, etc., I find I have misunderstood what is wanted and lose points because of it.
.60646	52.	I have trouble understanding just what a test question is asking.
.59632	9.	I get discouraged because of low grades.
.55558	72.	Often when studying I seem to get lost in details and "can't see the forest for the trees."
.54533	71.	I have difficulty adapting my studying to different types of courses.
.51847	20.	I do poorly on tests because I find it hard to plan my work within a short period of time.

.50690	2.	I am able to distinguish between more important and less important information during a lecture.
.49422	34.	When I study, I have trouble figuring out just what to do to learn the material.
.48147	77.	I have difficulty identifying the important points in my reading.
.47895	35.	When I begin an examination, I feel pretty confident that I will do well.
.43960	29.	I often feel like I have little control over what happens to me in school.
.43627	59.	When I take a test, I realize I have studied the wrong material.
.33861[a]	24.	I compare class notes with other students to make sure my notes are complete.

[a]Loaded .31945 on Factor 3.

Table 6. Factor loadings and LASSI items for Subscale 3- Concentration/preparation for class

Factor loading		LASSI Item
.80763	66.	I put off studying more than I should.
.69029	36.	When it comes to studying, procrastination is a problem for me.
.67985	68.	My mind wanders a lot when I study.
.63449	22.	I only study when there is the pressure of a test.
.60011	4.	After a class, I review my notes to help me understand the information.
.59485	26.	I review my notes before the next class.
.55953	3.	I find it hard to stick to a study schedule.
.52373	42.	I end up "cramming" for almost every test.
.51362	33.	I talk myself into believing some excuse for not doing a study assignment.
.50082	46.	I am distracted from my studies very easily.
.49286	10.	I am up-to-date in my class assignments.
.48934	56.	I read textbooks assigned for my class.
.48206	58.	When I decide to study, I set aside a specific length of time and stick to it.
.48093	39.	I am unable to concentrate well because of restlessness or moodiness.
.44887	61.	I concentrate fully when studying.
.44298	13.	Even when study materials are dull and uninteresting, I manage to keep working until I finish.

.43494[a]	48.	I make good use of daytime study hours between classes.
.40573[b]	11.	Problems outside of school-being in love, financial difficulties, conflict with parents, etc.-cause me to neglect my school work.
.38517	28.	I work hard to get a good grade, even when I don't like a course.
.36218	16.	I come to class unprepared.
.32978	74.	I tend to spend so much time with friends that my coursework suffers.
.32479	65.	I test myself to be sure I know the material I have been studying.

[a]Loaded .32211 on Factor 1.
[b]Loaded .34902 on Factro 2.

Table 7. Factor loadings and LASSI items for Subscale 4-Motivation

Factor loading		LASSI Item
.56081	43.	I find it hard to pay attention during lectures.
.51734	40.	I try to find relationships between what I am learning and what I already know.
.51447	49.	When work is difficult I either give up or study only the easy parts.
.51438	51.	I dislike most of the work in my classes.
.50313	69.	In my opinion, what is taught in my courses is not worth learning.
.48778	45.	I only study the subjects I like.
.43379	38.	I do not care about getting a general education, I just want to get a good job.
.42451	14.	I feel confused and undecided as to what my educational goals should be.
.42048	37.	I check to see if I understand what the instructor is saying during lecture.
.39920[a]	60.	It is hard for me to decide what is important to underline in a text.
.39567	55.	I don't understand some course material because I don't listen carefully.
.39527	19.	My underlining is helpful when I review text material.
.38250	5.	I don't care if I finish school as long as I find a husband/wife.
.37096	18.	I would rather not be in school.
.33532	6.	I find that during lectures I think of other things and don't really listen to what is being said.
.32355[b]	27.	I am unable to summarize what I have just heard in a lecture or read in a textbook.

[a]Loaded .39451 on Factor 2 and .30958 on Factor 1.
[b]Loaded .30155 on Factor 2.

SECTION II.

ACADEMIC ACHIEVEMENT AMONG UNDERGRADUATE NURSING STUDENTS: THE DEVELOPMENT AND TEST OF A CAUSAL MODEL

ACADEMIC ACHIEVEMENT AMONG UNDERGRADUATE NURSING STUDENTS: THE DEVELOPMENT AND TEST OF A CAUSAL MODEL

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ABSTRACT

This paper tests relationships among variables depicted in a causal learning model of academic achievement developed by the authors. The Learning and Study Skills Inventory (LASSI), Life Experience Survey (LES), and ASSET test were administered to 134 first semester nursing students at a two-year community college. The path analysis supported 11 of the 14 proposed pathways. Additional multiple regression computations did not reveal significant interrelationships among variables not depicted in the a priori model. Results indicated that language ability, reading ability and self-efficacy have a direct effect on the academic achievement of nursing students. Self-efficacy was found to be directly affected by the students' language ability, math ability, motivation, concentration and preparation for class. Life stress, motivation and self-monitoring/use of study strategies were found to influence students' concentration and preparation for class. In turn, self-monitoring and use of study strategies was found to be influenced by individuals' motivation. Overall, the model explained 46% of the variance in academic achievement. Although each of the factors was found to be related to academic

achievement, it is the combination of these factors that distinguish the effective learner from the less effective learner.

Key Concepts

Path analysis, academic achievement - nursing students, learning strategies.

ACADEMIC ACHIEVEMENT AMONG UNDERGRADUATE NURSING STUDENTS: THE DEVELOPMENT AND TEST OF A CAUSAL MODEL

Nurse educators are interested in reducing student attrition. When attrition decreases, a greater number of nursing students have positive learning experiences and the limited resources in nursing programs are more effectively utilized. Decreased attrition of nursing students also prevents or ameliorates nursing shortages.

One approach to the study of persistence is to increase understanding of the learning process. Researchers in this area have proposed that the academic achievement of a student depends jointly on two factors - 1) what information is presented and 2) how the learner processes that information. The latter has received increased attention in recent years (e.g., Cook & Mayer, 1983; Dansereau, 1985; Jones, Amiran & Katims, 1985; Weinstein & Underwood, 1985). For example, Wittrock (1974, 1978) defines the effective learner as an individual who actively processes, interprets and synthesizes information in order to acquire, store and retrieve it.

In this study a causal learning model of academic achievement among nursing undergraduates was developed and tested (see Figure 1). The model focuses on student

contributions to academic success as opposed to school effects and teacher effects. The fact that the arrows in the diagram are of different lengths simply reflect space limitation and is not reflective of strength of the relationships shown. The diagram simply depicts the causal ordering among variables. The model depicted the influence of cognitive, affective and learning strategies variables on academic achievement. Three cognitive variables, reading ability, language ability and math ability, as well as two affective variables, life stress and motivation, are presented as exogenous variables. They are considered to represent characteristics which undergraduate students bring to the learning environment. They are also characteristics over which students can exert little control in the short term. Each of them is viewed as having a direct effect on students' feelings of self-efficacy, which in turn, influences their academic achievement. In this study, self-efficacy measures students' perceptions of academic competence as well as their worries regarding academic performance, including test anxiety. Reading ability, language ability and math ability are also seen as directly influencing academic achievement.

In addition, in the model life stress and motivation are viewed to have direct effects on two learning

strategies variables - 1) self-monitoring/use of study strategies and 2) concentration/preparation for class. Learning strategies is a very broad term that encompasses a number of different competencies needed for effective learning and retention of information. The two learning strategies variables used in this study were identified by Chacko and Huba (1989, Section I, herein) in a validation study of the Learning and Study Strategies Inventory (LASSI) with a group of undergraduate nursing students.

Dansereau (1985) states that students use primary and support strategies for effective learning. Primary strategies, such as paraphrasing, imagery and networking, are used to acquire, store and retrieve information. Support strategies, such as planning, scheduling and concentrating, are used to maintain a suitable state of mind for learning.

According to this scheme, self-monitoring/use of study strategies would probably be categorized as a primary strategy and concentration/preparation as a support strategy. As measured in this study, these variables represent skills which probably can be acquired in an educational setting and thus are characteristics over which students have control. In the model, self-monitoring and use of study strategies is viewed to

influence one's concentration and preparation for class, which in turn, is viewed to affect one's feelings of self-efficacy (see Figure 1). Following is the rationale for this configuration.

Researchers have shown that cognitive ability is a good predictor of academic achievement (e.g., Allchnie & Bellucci, 1981; Felts, 1986; Glick, McClelland & Yang, 1966; Hayes, 1981; Kissinger & Munjas, 1982; Oliver, 1985; Sharp, 1984; Woodham & Taube, 1986; Yess, 1980). Since most measures of cognitive ability are rather omnibus and generalized in nature, the role that these variables play in the learning process cannot be easily specified. However, it is logical that the extent of current learning depends on the extent of previous learning and that individuals with high cognitive ability would have increased feelings of self-efficacy. Therefore, it was hypothesized that an individual's cognitive ability directly influences one's academic achievement and one's feelings of self-efficacy (see Figure 1).

Several studies have suggested that highly test anxious students experience cognitive interference, which is a key factor in the lowering of academic performance (e.g., Deffenbacher, 1980; Sarason, 1972, Sarason & Stoops, 1978; Wine, 1971; 1980). The research cited

above focused strictly on test anxiety. Other researchers were concerned with the influence of general academic anxiety on the performance of students, as addressed in self-efficacy theory (Bandura, 1978; 1982; Schunk, 1983). Self-efficacy is concerned with people's judgments of their capabilities and their ability to use these capabilities (Bandura, 1982; Schunk, 1983). Individuals who view themselves inefficacious dwell on their personal deficiencies and imagine potential difficulties, creating stress and concern over failing. On the other hand, individuals who have strong feelings of self-efficacy perform tasks with virtually no anxiety or apprehension and persist until they succeed (Bandura, 1982). Thus, "the higher the level of perceived self-efficacy, the greater the performance accomplishments" (Bandura, 1982, p. 127). This supports the hypothesis that feelings of self-efficacy have a direct effect on academic achievement (see Figure 1).

With regard to the affective variable, life stress, research has shown that it has a negative association with academic achievement (de Meuse, 1985; Garrity & Ries, 1985; Lloyd, Alexander, Rice, & Greenfield, 1980). According to Davies (1986), stress-related problems of students include poor concentration, persistent worries, panic reactions and certain minor health problems. For

this study it was hypothesized that life stress indirectly influences academic achievement by its direct negative effect on a student's ability to self monitor and use study strategies, on one's ability to concentrate and prepare for class and on one's feelings of self-efficacy (see Figure 1).

Although motivation, an affective variable, is known to be an important precursor to academic achievement (Davies, 1986; Weinert, 1987), the nature of its influence is not unequivocally understood. In this study, motivation measures an individual's interest in learning and determination to reach an educational goal. It can be argued that students who are highly motivated to complete an educational program of study are likely to use and monitor the study strategies they have learned. In addition, they would concentrate on their studies and prepare for class. Lastly, increased motivation and goal orientation would promote positive feelings of self-efficacy. Thus, it was hypothesized that motivation indirectly influences academic achievement by its direct effect on a student's self-monitoring and use of study strategies, concentration and preparation for class, and feelings of self-efficacy (see Figure 1).

Finally, experts suggest that academically successful students have greater use of study skills such

as deep processing and elaborative thinking than students who are less successful academically (Bruch, Pearl and Giordano, 1986; Dansereau, 1985; Weinstein and Rogers, 1985; Wittrock, 1978). However, instructing students in the use of study strategies and self-monitoring does not always lead to increased academic achievement (Altmaier & Woodward, 1981; Dendato & Diener, 1986). This suggests that study strategies and self-monitoring have an indirect effect on academic achievement. Adult learners who have developed study strategies and self-monitoring skills may be better able to concentrate on their studies and prepare for class than those who have not. In turn, individuals who concentrate and prepare for class, in addition to using study strategies and self-monitoring skills, are likely to experience positive feelings of self-efficacy. With this rationale, it was hypothesized that individuals' self-monitoring and use of study strategies have a direct influence on their concentration and preparation for class, which in turn, have a direct effect on their feelings of self-efficacy.

Methodology

Subjects

The subjects of this study consisted of 134 first-year nursing students enrolled at a midwestern

community college during the 1988-89 academic year (88% of total enrollment). This is a multicampus college with three of the four campuses having a nursing program. Seventy-one of the subjects were from the main campus, 39 and 24 from the other two campuses. Ninety-seven percent of the students were females. The subjects were largely adult learners, as 68 percent of the nursing students were over 24 years of age (mean = 29, median = 27). The largest portion of the subjects was married (44%). Thirty-five percent were single and 21 percent were separated or divorced. It should be noted that single subjects included both students with and without children. Over one-third of the subjects worked more than 20 hours per week.

Instrumentation

Three instruments were used to measure the cognitive, affective and learning strategies variables - 1) the ASSET test (ASSET Technical Manual, 1986), 2) the Life Experience Survey (LES) (Sarason, Johnson & Siegel, 1978) and 3) a modified version of the Learning and Study Strategies Inventory (LASSI) (Weinstein, 1987; Chacko & Huba, 1989, Section I, herein). The dependent variable, academic achievement, was measured by students' grades

obtained in an introductory nursing theory course (Human Needs I).

ASSET The ASSET test (ASSET Technical Manual, 1986) is an advising and planning tool developed by the American College Testing Program in 1982 for specific use with students entering two-year institutions. It was used for measuring the cognitive variables of verbal and math ability. Verbal ability is one's ability in language usage and reading skills and math ability is one's ability in numerical skills. Verbal ability is measured by two scales on the basic skills level of the ASSET test and math ability is measured by one scale.

The reliability coefficient estimates reported in the manual for the scales are 0.87 for the language usage skills, 0.91 for the reading skills and 0.88 for the numerical skills. Predictive validity was obtained by the authors by correlating the students' results with course grades. The correlations between the language usage skills test and the course grades for five related courses ranged from .15 to .30. Correlations between the reading skills test and course grades in eleven related courses ranged from .15 to .42. The numerical skills test was correlated with nine related courses. The correlations ranged from .27 to .42. The lowest correlations were found for courses in which the

institution used the test scores for placement (ASSET Technical Manual, 1986). This result was anticipated because of increased homogeniety among the students in these courses.

LES The LES (Sarason, Johnson & Siegel, 1978) was developed to measure an individual's life stress. Section 1 of the LES was used for this study. From a list of 47 specific events, the individual indicates which items pertain to oneself. One's perception of that life event is indicated on a Likert scale ranging from extremely positive (+3) to extremely negative (-3). Three blank spaces are provided to allow the individual to indicate other stressful life experiences not listed. Positive, negative and total change scores are tabulated for each respondent. In the current study, the negative change score was used to measure life stress, the result of negative changes in one's life that requires adaptation, coping and social adjustment.

As reported by the authors, the test-retest reliability coefficients obtained from two samples were as follows - .19 and .53 ($p < .001$) for the positive change score, .56 ($p < .001$) and .88 ($p < .001$) for the negative change score and .63 ($p < .001$) and .64 ($p < .001$) for the total change score (Sarason et al., 1978).

Validity was examined by correlating the LES with State-Trait Anxiety Inventory (STAI) and grade point averages. The total and negative change scores of the LES correlated significantly and in a positive direction with the STAI (Spielberger, Gorsuch, & Lushene, 1970). Positive change score was not significantly correlated to either measure. Positive, negative and total change scores were all found to be negatively correlated with grade point average. The relationship between life change scores and the short form of the Marlowe-Crowne Social Desirability Scale (Strahan & Gerbasi, 1972) was nonsignificant, suggesting that responses to the LES are relatively free from the influence of social desirability response bias (Sarason et al., 1978).

Modified LASSI The LASSI (Weinstein, Schulte & Palmer, 1987) is a self-report instrument used to measure student's learning strategies and study skills. It consists of 77 items written in a Likert scale format. After reading each item the student responds if the statement is not at all typical of him/her (1), not very typical of him/her (2), somewhat typical of him/her (3), fairly typical of him/her (4) or very much typical of him/her (5). According to Weinstein (1987) the instrument provides ten separate subscales measuring

learning strategies of students. The ten subscales are study aids, select main ideas, information processing, self testing, test strategies, attitude, motivation, concentration, time management and anxiety.

A validation study of the LASSI with undergraduate nursing students was conducted by Chacko and Huba (1989, Section I, herein). A factor analysis of the LASSI data resulted in four subscales - 1) self-monitoring/use of study strategies, 2) self-efficacy, 3) concentration/preparation for class and 4) motivation. Reliability estimates for the four subscales were .86, .88, .91 and .80 respectively. These subscales were used in the current study as measures of affective and learning strategies variables.

As mentioned above, the instrument uses a Likert scale with the subjects' responses ranging from one to five, with one being not at all typical of me and five being very much typical of me. Some items are stated in a positive direction and others are stated in a negative direction. In the current study, all negatively stated items were recoded so all scales were scored in the positive direction. The scale score was obtained by averaging the sum of the item scores by the number of items. This resulted in a possible score range of one to five for each of the four scales. The higher the score,

the more the construct was presumed to be present, i.e., a high motivation score reflected strong motivation in the individual.

The self-monitoring/use of study strategies subscale measures the individual's techniques used for the processing of incoming information as well as one's assessment of the effectiveness of these techniques. This subscale consists of 18 items. Following are two examples of items from this scale. "I make simple charts, diagrams, or tables to summarize material in my courses" and "I stop periodically while reading and mentally go over or review what was said."

Self efficacy measures one's perception of academic competence and one's worry regarding academic performance. This subscale consists of 19 items. "When I begin an examination I feel pretty confident that I will do well" and "I worry that I will flunk out of school" (reverse coded) are two examples from the scale.

The concentration/preparation for class subscale consists of 22 items. It measures an individual's ability to focus on academic tasks and to use time management principles for completing class assignments and preparing for examinations. Two examples of items are "My mind wanders a lot when I study" (reverse coded) and "I review my notes before the next class."

The motivation subscale consists of 16 items and measures an individual's interest in learning as well as one's diligence in studying in order to succeed academically. Two examples of the items are "When work is difficult I either give up or study only the easy parts" (reverse coded) and "I try to find relationships between what I am learning and what I already know."

Academic achievement Final grades obtained by the subjects in the first nursing theory course, Human Needs I, were used as an indicator of the dependent variable, academic achievement. The subjects' course grades were computed as follows: 1) first, the subject's percentage correct was computed for each of the seven exams in the course, 2) next, the percentage scores were multiplied by the assigned weight for the exam, reflecting the emphasis of that unit in the course and 3) finally, the weighted scores were summed to obtain the subject's final grade in the course. As the course is taught by different instructors on different campuses using the same examination blue prints, each subject's course grade was converted to a z-score within his/her class.

Procedure

Consent was obtained from the subjects for participation in the study and for the release of ASSET

scores and course grades for the introductory theory course, Human Needs I. The LES and LASSI instruments were administered to subjects between the fourth and sixth week of the semester during Fall 1988. ASSET scores were obtained from the subjects' file records and after the completion of the semester, the subjects' grades in Human Needs I were obtained.

Preliminary analysis

The relationships among the variables were examined and are presented in Table 1. Because a significant relationship between life stress and self-monitoring/use of study strategies did not exist, this pathway in the model was deleted. The remaining 14 pathways were retained in the model since they were not incompatible with the bivariate correlations. Correlations among exogenous variables can also be seen in Table 1. The only significant relationships were among reading ability, language ability and math ability. The correlations ranged from .45 to .55.

Data analysis

Path analysis was the statistical procedure used for testing the model. Multiple regressions were computed using as criterion variables each of the four endogenous variables shown in the model - academic achievement,

self-efficacy, concentration/preparation for class and self-monitoring/use of study strategies. In each case, variables specified as having a direct effect on the criterion constituted the predictor variable set. Additional multiple regressions were conducted to determine if any paths not described in the a priori model were significant. The significance criterion for retaining a path coefficient was $p < .05$. Due to the presence of missing data on some variables, the path analysis was conducted on 95 subjects for whom there was no missing data.

Results

The mean, standard deviation and range of the subjects' scores for each of the variables are reported in Table 2. Figure 2 portrays the results of the path analysis. Eleven of the proposed 14 pathways remaining in the model following the preliminary analysis were supported by the path analysis (See Figure 2). No unspecified path was significant.

As hypothesized, each of the two dimensions of verbal ability was found to have a direct effect on academic achievement. In addition, the hypothesis that self-efficacy has a direct effect on academic achievement

was supported by the analysis. No other variables were found to have direct effects on achievement.

Four of the six variables hypothesized to have a direct effect on self-efficacy were supported by the path analysis. The four variables consisted of the language ability, math ability, motivation and concentration/prepartion for class. In addition, as expected, self-monitoring/use of study strategies was not found to have a direct effect on self-efficacy.

Students' life stress, motivation and self-monitoring/use of study strategies were found to have a direct effect on their concentration and preparation for class. No other variable in the model was found to have a direct effect on concentration/ preparation for class. Motivation was the only variable directly related to students' self-monitoring and use of study strategies.

The path analysis did not confirm three of the proposed pathways. First, math ability did not have a direct influence on one's academic achievement. Second, an individual's reading ability was not found to have a direct influence on one's feelings of self-efficacy. Third, life stress was not found to have a significant influence on one's self-efficacy and academic anxiety.

As can be seen in Figure 2, almost half of the variance in academic achievement was accounted for. Reading ability and language ability accounted for 38% of the variance in academic achievement. Self-efficacy was found to additionally account for eight percent of the variance in academic achievement. The residual coefficients for academic achievement, self-efficacy, concentration/preparation for class and self-monitoring/use of study strategies indicate that the model does not explain a considerable portion of the variance in these variables (see Figure 2). The direct, indirect and total effects of the variables are reported in Table 3.

Discussion

The model presented in this paper depicts relationships among cognitive variables, affective variables, learning strategies variables and academic achievement for students in a two-year nursing program. As expected, support was found for the hypothesis that reading ability and language ability directly affect one's academic achievement. Many researchers have found that cognitive ability is a strong predictor of academic achievment (e.g., Allchnie & Bellucci, 1981; Felts, 1986; Glick, McClelland & Yang, 1986; Hayes, 1981; Kissinger &

Munjas, 1982; Oliver, 1985; Sharp, 1984; Woodham & Taube, 1986; Yess, 1980). Furthermore, it is generally accepted on logical grounds that current achievement is influenced by previous achievement. The current finding supports the appropriateness of pursuing validity studies to develop guidelines for the use of the ASSET's reading ability and language ability tests for academic counseling with students in a two-year nursing program. Such guidelines would assist academic counselors in assessing students' preparedness for entering the nursing program. If students were found not to be academically prepared in the reading and language areas to enter the program, they could be advised to participate in developmental studies to assist them in obtaining the necessary skills. Assuring that subjects are appropriatedly prepared for the nursing program would promote feelings of self-efficacy as well as academic success.

The failure to find subjects' math ability to have a direct effect on their academic achievement was unexpected. Math ability was indirectly related to academic achievement via its direct effect on one's feelings of self-efficacy. This finding is consistent with the view that many nursing students perceive themselves as having poor math skills, leading to

increased academic anxiety and negative feelings of self-efficacy. The finding that math ability was directly related only to self-efficacy and not to academic achievement may be due to the way math ability was measured in this study. The numerical scale of the ASSET is mainly comprised of elementary arithmetic skills, such as addition, subtraction, multiplication, and use of decimals and fractions. It does not include the advanced math skills of algebra that are used for drug calculations and problem solving in the nursing curriculum. Further research should examine if the use of the ASSET's elementary algebra test would assist in determining students' preparedness for the nursing program.

An unusual finding was that a direct effect on one's feelings of self-efficacy was found for language and not for the reading component of verbal ability. One possible explanation is that students may have viewed themselves as having sufficient reading skills for the reading and comprehension of textbooks, but some may have been unsure of possessing the communication skills needed for working with clients and other health team members. This uncertainity could have result in decreased feelings of self-efficacy. Further research is needed to explore this view.

The path analysis supported the view that life stress has a negative effect on academic achievement (de Mueuse, 1985; Garrity & Ries, 1985; Harris, 1973; Lloyd, Alexander, Rice & Greenfield, 1980) via its direct influence on one's concentration and preparation for class. Although the effect of life stress on one's concentration and preparation for class was significant, the strength of this effect was almost negligible. This may be due to the fact that, for this population of primarily adult learners, a more appropriate variable would have been the ability to react to and cope with life stress. The degree of life stress does not necessarily correspond with an individual's ability to cope with this stress. Further study needs to be conducted to explore how an individual's ability to cope with life stress affects one's learning process.

Motivation has been viewed as a strong influencing factor on academic achievement, but the exact nature of its influence is not known. In the proposed model, it was suggested that motivation has a significant direct effect on three separate variables - self-monitoring/use of study strategies, concentration/preparation for class and feelings of self-efficacy. The results of the path analyses supported these relationships. These findings support the views of McCombs (1988) and Covington (1983),

who contend that motivation helps individuals allocate attention and effort to academic tasks. They are also compatible with the contention of McCombs (1988) and Covington (1983) that increased motivation produces increased feelings of self-efficacy. This indicates the importance of assessing students' motivation to succeed in their educational goals. A nursing curriculum that will maintain or enhance students' motivation needs to be provided. In addition, educators need to assess if the lack of student motivation results from the nature of the nursing curriculum or from the students' personal goals.

With regard to the two learning strategies variables, the path analysis revealed that students' use of study strategies and self monitoring affects their concentration and prepartation for class, which, in turn, influences their feelings of self-efficacy. The use of study strategies and self-monitoring skills allows individuals to devote time and effort towards the desired learning goals. Although the literature supports an opposing view that one's anxiety and self-efficacy affect the amount of time and energy allocated to learning, one could argue the reverse to be true, especially with adult learners. When a highly motivated student concentrates and spends considerable time on learning educational material, it is logical that increased feelings of

self-efficacy would result. This suggests the importance of educators assessing whether or not students possess these skills. If deficiences are found in these areas, assistance can be given in finding resources to help them obtain skills for studying, self-monitoring, concentrating, and preparating for classs.

Recent research has demonstrated that instructing individuals in the use of learning strategies is one way to influence the manner in which individuals process new information and skills (Miller, Alway, & McKinley, 1987; Biggs, 1984; Bliss & Mueller, 1987; Dansereau, Brooks, Holley, & Collins, 1983; Dansereau, Collins, McDonald, Holley, Garland, Diekhoff & Evans, 1984; Foster & Leung, 1985; Jones, Amiran & Katims, 1985; McCombs, 1981; Nisbet & Shucksmith, 1986; Orantes, 1985; Weinstein & Mayer, 1986; Weinstein & Underwood, 1985). However, the mere possession of these skills will not guarantee academic achievement. The use of skills for studying, self-monitoring, concentrating and preparing for class may need to be promoted through motivation or encouragement.

A limitation of this study is the use of self-report instruments to measure all independent variables with the exception of reading ability, language ability and math ability. These measures are more likely to reflect

subjects' perceptions than their actual behaviors. Cautious interpretations of causality are warranted due to the small sample size and cross-sectional nature of the data. Further research is needed to explore these relationships with other samples of nursing students and with students from other disciplines.

These findings support the view that academic achievement of students results from a complex process of learning. High academic achievement of students may be attributed to their high cognitive ability, decreased life stress, high motivation, increased feelings of self-efficacy and effective skills in study strategies, concentration and preparation for class. Though each of these factors is related to academic achievement, it is the combination of these factors that distinguish the effective learner from the less effective learner.

Table 1. Intercorrelations of variables[a]

	RA	MA	LS	M	SM/USS	C/P	SE	AA
Language ability (LA)	.48** (106)	.45** (99)	.00 (106)	.10 (106)	-.02 (106)	-.16 (106)	.38** (106)	.48** (102)
Reading ability (RA)		.55** (99)	.00 (106)	.04 (106)	.04 (106)	.11 (106)	.34** (106)	.50** (102)
Math ability (MA)			-.10 (99)	.01 (99)	.06 (99)	-.05 (99)	.44** (99)	.52** (95)
Life stress (LS)				-.08 (134)	-.06 (134)	-.23** (134)	.21** (134)	-.10 (122)
Motivation (M)					.56** (134)	.50** (134)	.43** (134)	.15* (129)
Self-monitoring/use of study strategies (SM/USS)						.60** (134)	.30** (134)	.10 (129)
Concentration/ preparation for class (C/P)							.30** (134)	.07 (129)
Self-efficacy (SE)								.49** (129)
Academic achievment (AA)								

[a]Numbers in parentheses indicate N. *p<.05. **p<.01.

Table 2. Means, standard deviations and ranges of subjects scores on variables.

	Mean[a]	SD	Range	
			Actual	Potential
Language ability	49.35 (41.84)	6.74 (10.24)	15-61	0-64
Reading ability	31.59 (22.38)	6.80 (9.11)	3-40	0-40
Math ability	22.73 (17.54)	5.57 (6.72)	7-32	0-32
Life stress	10.28 (5.64)	10.11 (6.43)	0-61	0-189
Self-monitoring/use of study strategies	3.52	.55	1.78-5.00	1-5
Self efficacy	3.41	.62	1.58-4.58	1-5
Concentration/ preparation for class	3.40	.61	1.45-4.77	1-5
Motivation	4.18	.44	2.44-5.00	1-5

[a]Numbers in parentheses indicate norm data for the ASSET and LES.

Table 3. Path Effects

Dependent Variable	Independent Variable	Direct Effect	Indirect[a] Effect	Total Effect
Academic achievement	Motivation	0	.15	.15
	Use of study strategies/ self-monitoring	0	.04	.04
	Concentration/ preparation for class	0	.09	.09
	Math ability	0	.11	.11
	Language ability	.29	.09	.38
	Reading ability	.28	0	.28
	Self-efficacy	.33	0	.33
Self efficacy	Motivation	.33	.13	.46
	Use of study strategies/ self-monitoring	.00	.12	.12
	Concentration/ preparation for class	.26	0	.26
	Math ability	.28	0	.28
	Language ability	.24	0	.24
Concentration/ preparation for class	Motivation	.26	.25	.51
	Use of study strategies/ self-monitoring	.45	0	.45
	Life stress	-.19	0	-.19
Use of study strategies/ self-monitoring	Motivation	.55	0	.55

[a]See Haber (1976) for calculations.

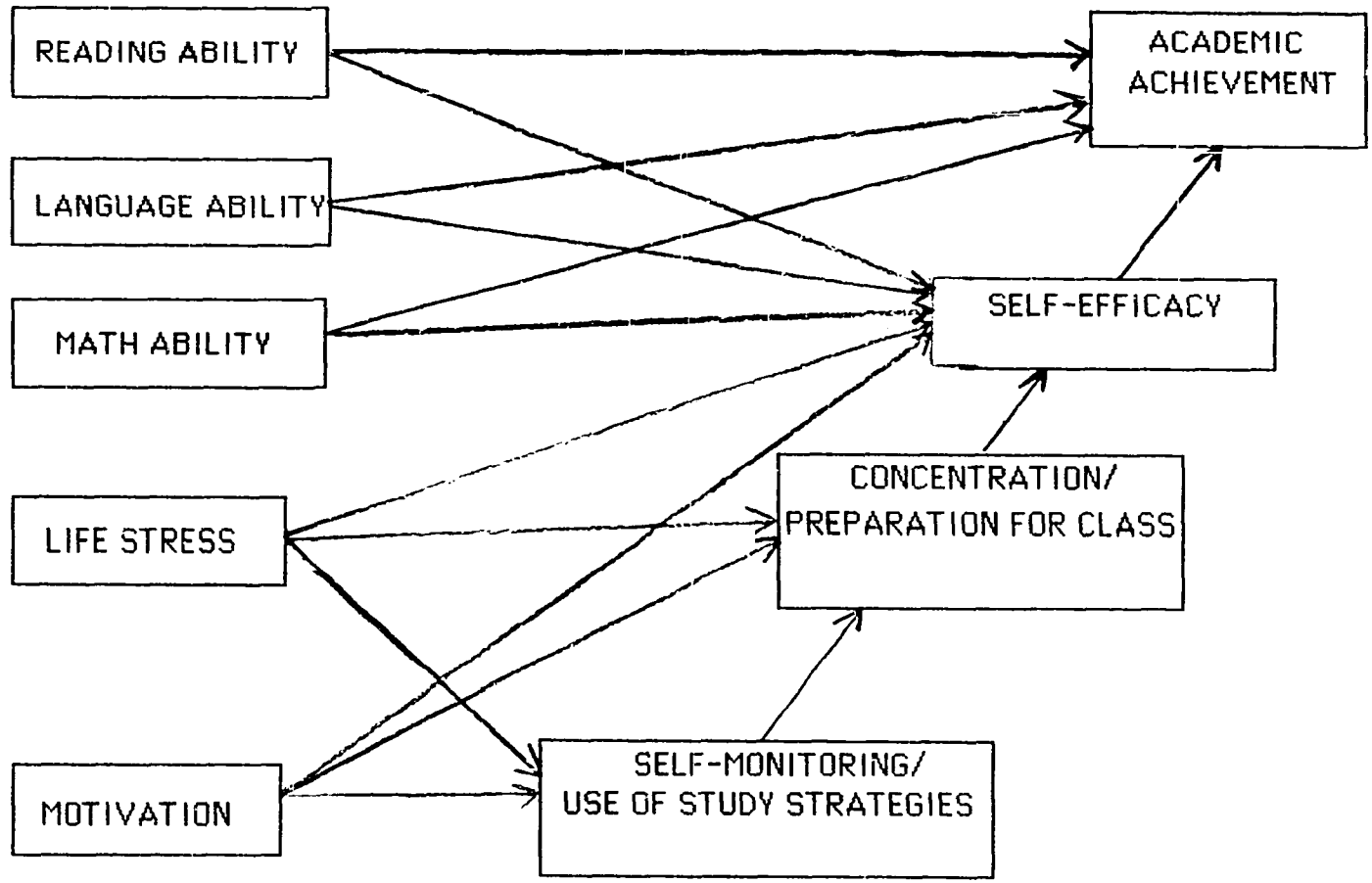

Figure 1. Multistage Causal Learning Model of Academic Achievement

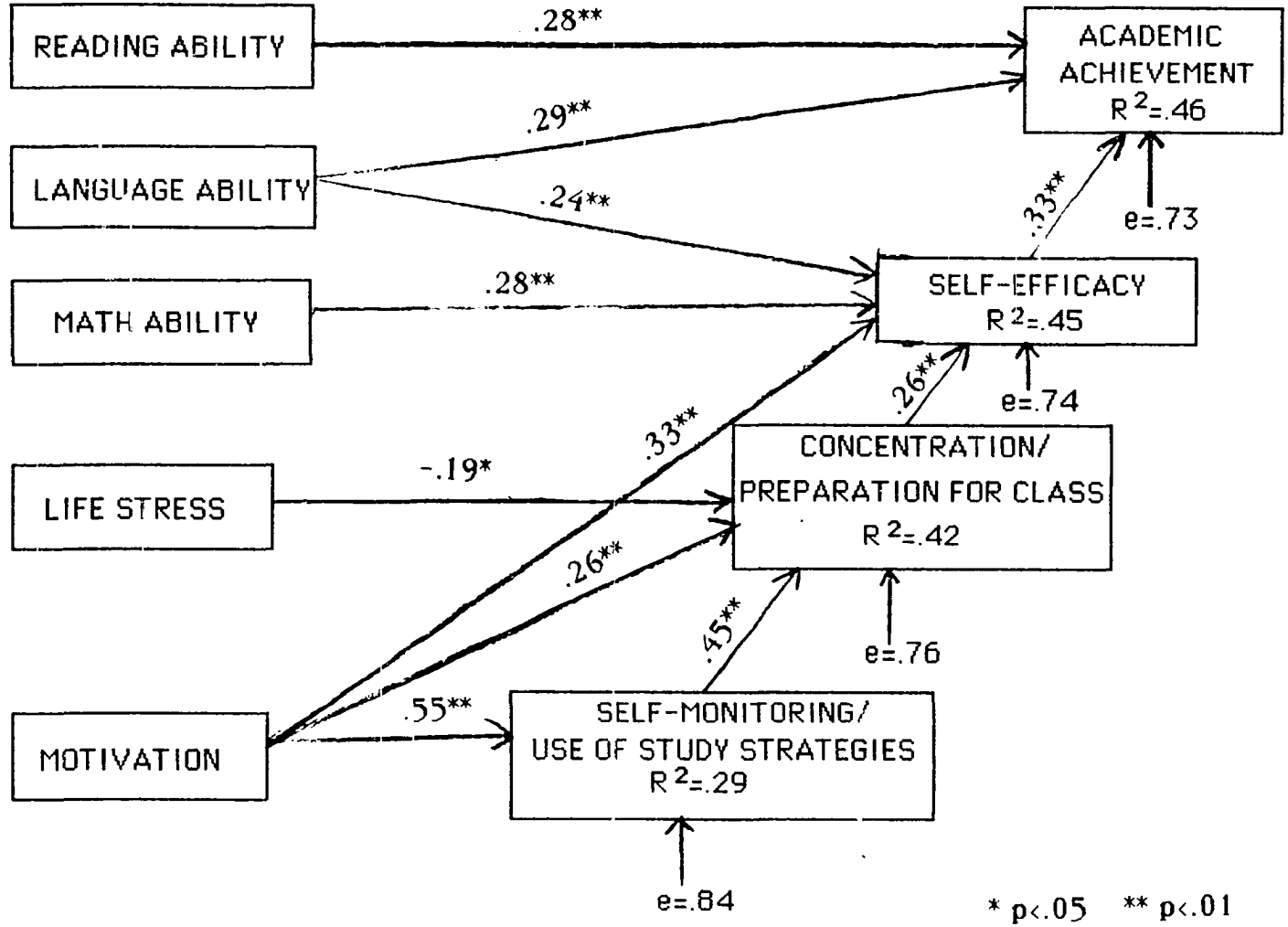

Figure 2. Multistage Path Model of Academic Achievement

SUMMARY AND RECOMMENDATIONS

Numerous studies have investigated predictor variables of academic achievement. Currently there is a limited availability of valid and reliable instruments that comprehensively assess the learning process of individuals. In addition, limited research has been devoted to exploring and testing the interrelationhips among factors related to academic achievement.

The present research had two purposes. First, the study was designed to validate the Learning and Study Strategies Inventory (LASSI) (Weinstein, 1987) with undergraduate nursing students. Second, a multistage causal model of learning for undergraduate students was developed and tested. Results of the validation study was used for the developement of the model.

The data were collected on 134 first-year nursing students enrolled at a Midwestern community college. Analysis of the data included 1) factor analysis of the LASSI data, 2) Cronbach alphas to estimate factor internal consistencies of the revised LASSI scales 3) Pearson product-moment correlations to determine the relationships among the various variables related to academic achievement and 4) path analysis of the proposed model of causal learning.

Factor analysis of the LASSI data indicated the existence of four learning process subscales with the current sample of students. The four subscales were self-monitoring/use of study strategies, self-efficacy, concentration/preparation for class and motivation. These showed moderate to high internal consistency estimates that ranged from .80 to .91.

The path analysis indicated that language ability, reading ability and self-efficacy have a direct effect on the academic achievement of nursing students. Self-efficacy was found to be directly affected by the students' language ability, math ability, motivation, concentration and preparation for class. Life stress, motivation and self-monitoring/use of study strategies were found to influence students' concentration and preparation for class. In turn, self-monitoring and use of study strategies was found to be influenced by individuals' motivation. Overall, this model explained 46% of the variance in academic achievement.

Recommendations for Further Study

The results of this study indicate that the variables influencing the learning process are highly interrelated and overlap. Researchers need to focus on the basic work of identifying variables that comprise the learning process and continue to work on refining the

definition of these variables to obtain clear and distinct variables. The findings of this study support the view that academic achievement of students results from a complex process of learning. High academic achievement of students may be attributed to their high cognitive ability, decreased life stress, high motivation, increased feelings of self-efficacy and effective skills in study strategies, concentration and preparation for class. Though each of these factors are related to academic achievement, it is the combination of these factors that distinguish the effective learner from the less effective learner. Further research is needed to explore these relationships with other samples of nursing students and with students from other disciplines.

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APPENDIX A.

CORRESPONDENCE

IOWA STATE
UNIVERSITY

College of Education
Professional Studies
N243 Lagomarcino Hall
Ames, Iowa 50011

Telephone 515-294-4143

Fall 1988

Dear Student,

As an educator I am concerned about how teachers can assist students to be academically successful. As part of my Ph.D. program in Education at Iowa State University, I am investigating the interrelationships of various factors that influence academic achievement. By increasing the understanding of factors affecting learning and academic achievement, educators can be more helpful to students in their academic endeavors.

For this reason, I am asking you to participate in this study. Your participation is voluntary. Your decision to participate or not to participate will not affect your grade.

Participation in the study involves the completion of the Learning and Study Strategies Inventory and the Life Experiences Survey. The major focus of these instruments is to obtain information regarding your learning and study strategies and personal life stresses. In addition, I am asking for permission to obtain your scores on the ASSET and your grade in NURS254 Human Needs I and NURS255 Nursing Practicum I.

The information obtained from you will be kept confidential. No individual responses will be reported; data obtained will be grouped and reported in summary form only. As the researcher, I assure you of complete confidentiality.

Your participation is important! Again, I ask for your cooperation. If you have any questions regarding this study you may call me at 432-7203, extension 50. Thank you.

Sincerely,

Sandra J. Chacko

Sandra J. Chacko

Consent Form

I, _____, am willing to participate in the Causal Learning Model of Academic Achievement Study. I give permission to have the following information to be released to Sandra J. Chacko for the purpose of conducting this reasearch study.

YES	NO	
_____	_____	ASSET score.
_____	_____	NURS254 Human Needs I and NURS255 Nursing Practicum I grades

Do you wish to receive the results from this study?

_____ Yes _____ No

APPENDIX B.

PATTERN MATRIX OF FACTOR LOADINGS

PATTERN MATRIX OF FACTOR LOADINGS

LASSI Item	Factor 1 Self-monitoring/ use of study strategies	Factor 2 Self-efficacy	Factor 3 Concentration/ preparation for class	Factor 4 Motivation
23	.61294	-.00977	.10732	-.11416
76	.58068	.20312	-.15749	-.04440
8	.56488	.12316	.07597	-.07873
67	.54882	.15002	.08876	-.23422
32	.54177	-.04145	-.05169	-.31459
30	.53403	.09026	-.06879	-.04987
50	.53131	-.08331	-.09760	.09701
21	.51143	-.00138	-.16887	.04300
7	.48905	-.09671	-.03597	-.09949
12	.46777	.22670	-.09992	.02667
17	.45173	-.03899	-.26691	.03448
53	.44853	-.03747	-.26901	.02405
44	.41970	.19131	-.08030	.32687
47	.41382	.04346	.06114	-.30698
15	.40085	.05000	-.11920	-.02615
70	.39531	-.22583	-.35933	-.29774
62	.35226	-.11676	-.04004	-.27326
41	.30690	.03431	-.07866	-.29503
73	.26559	-.19128	-.11341	-.09151
57	.01963	.81289	-.02988	.19126
63	-.03236	.75601	-.07626	.00721
54	-.01170	.69162	-.11241	.08834
31	-.03064	.67143	.07911	.12585
25	.01515	.63532	-.12311	-.05704
1	-.00870	.63507	-.01747	.02093
75	.06867	.61174	-.10999	-.04361
52	-.08044	.60646	-.00973	-.14913
9	-.06778	.59632	-.04359	.04921
72	.26860	.55558	-.08036	-.13537
71	.13573	.54533	.02739	-.16755
20	-.03772	.51847	-.03953	-.22623
2	.24367	.50690	.21689	-.00346
34	.22445	.49422	.00813	-.29065
77	.24541	.48147	.01104	-.25349
35	.26166	.27985	-.05166	.26746
29	.05862	.43960	-.12211	-.25285
59	-.19864	.43627	-.19701	-.02984
24	-.02749	.43627	-.19701	-.02984
66	-.08564	.06335	-.80763	-.09168

36	.01094	.02767	-.69029	-.03674
68	-.08843	.20721	-.67985	-.05297
22	-.04390	-.03821	-.63449	-.20578
4	.18126	-.17325	-.60011	.17456
26	.17926	-.37463	-.59485	.06175
3	.06264	.10662	-.55953	-.04814
42	-.02348	.24156	-.52373	.18419
33	.05126	.13329	-.51362	-.10446
46	-.06699	.26021	-.50082	-.23277
10	.28275	-.02557	-.49286	.01366
56	.24884	-.07927	-.48934	-.10203
58	.22883	-.18833	-.48206	.02728
39	-.12978	.33878	-.48093	-.25657
61	.26856	.16543	-.44887	.03824
13	.28676	-.13995	-.44298	-.23030
48	.32211	.03620	-.40573	-.08067
11	-.07580	.34902	-.40573	-.08067
28	.19596	.04882	-.38517	-.17709
16	.19684	-.24503	-.36218	-.21942
74	-.08282	.17101	-.32978	-.29987
65	.18274	.09761	-.32479	-.05411
43	-.25951	.07799	-.16799	-.56081
40	.28620	.07434	.19230	-.51734
49	.25920	.16687	-.08841	-.51447
51	.00486	-.08192	-.07273	-.51438
69	-.10596	-.04350	-.09772	-.50313
45	.07332	.01942	-.04811	-.48778
38	.07986	-.04826	-.08811	-.43379
14	.11014	.13831	.02062	-.42451
37	.04235	-.15851	-.08444	-.42048
60	.30958	.39451	.25882	-.39920
55	.01104	.28780	.10478	-.39567
19	.21100	-.07485	.02387	-.39527
5	.05373	.08908	-.01329	-.98250
18	.08492	-.01796	-.17981	-.37096
6	-.21671	.28142	-.24948	-.37096
27	-.23193	.30115	.11804	-.32355
64	.08926	.10107	-.08886	-.22311

APPENDIX C.

STRUCTURE MATRIX OF FACTOR LOADINGS

STRUCTURE MATRIX OF FACTOR LOADINGS

LASSI Item	Factor 1 Self-monitoring/ use of study strategies	Factor 2 Self-efficacy	Factor 3 Concentration/ preparation for class	Factor 4 Motivation
76	.65886	.28858	-.35076	-.27863
32	.63653	.07634	-.28501	-.46761
23	.61263	.06675	-.09432	-.24856
67	.60350	.24184	-.14233	-.38378
8	.57828	.19126	-.11484	-.23150
30	.57657	.16339	-.24009	-.22806
70	.55149	-.09852	-.53008	-.46333
21	.54693	.06259	-.30013	-.14059
50	.52338	-.03301	-.21219	-.05851
7	.51539	-.02300	-.19093	-.22455
12	.51326	.28236	-.24445	-.16551
53	.51322	.03213	-.38451	-.16363
17	.51285	.02898	-.38032	-.15322
47	.48423	.13559	-.14215	-.40939
15	.44670	.10919	-.24307	-.17522
62	.42441	-.02779	-.20215	-.35911
41	.37489	.18843	-.12647	.15905
73	.30113	-.13616	-.19496	-.16116
57	.06506	.78499	-.05833	.03844
63	.06947	.75827	-.13498	-.13445
54	.07135	.68556	-.14890	-.05768
25	.13426	.65811	-.20147	-.20356
31	-.01349	.63921	.05998	.04049
75	.17791	.63685	-.19749	-.19694
1	.05980	.63214	-.06793	-.09038
52	.02862	.62416	-.08373	-.23409
72	.38817	.61549	-.24358	-.32492
71	.23271	.58634	-.10646	-.29022
9	-.00382	.58451	-.06625	-.04663
34	.35443	.56778	-.17930	-.43370
20	.09088	.55680	-.13833	-.31572
77	.36318	.55069	-.17098	-.39922
2	.23920	.51405	.10102	-.09710
29	.20890	.50062	-.24783	-.37725
35	.25622	.46638	-.09630	.10073
59	-.08791	.43790	-.18979	-.10467
66	.17194	.14424	-.81445	-.29911
36	.21700	.09884	-.70590	-.24957

68	.13865	.26936	-.68863	-.24957
22	.18493	.05082	-.67465	-.35996
3	.24379	.17332	-.59998	-.23550
26	.28819	-.31080	-.59365	-.08413
4	.28320	-.12806	-.58737	-.00783
56	.40462	.01051	-.57940	-.28863
13	.45853	-.02832	-.57294	-.40410
46	.16427	.33902	-.56939	-.39555
33	.23766	.20417	-.56867	-.28084
10	.41417	.04838	-.56589	-.19224
39	.11090	.41299	-.54565	-.41048
48	.45480	.11593	-.53551	-.23752
61	.40187	.22956	-.52887	-.18462
58	.33581	-.12359	-.52129	-.13323
28	.35679	.13608	-.49266	-.34305
42	.09973	.25572	-.48934	.00665
16	.33062	-.15253	-.45433	-.32899
11	.09753	.39201	-.43866	-.23044
74	.10895	.24382	-.40394	-.39656
65	.29885	.15677	-.39964	-.20846
24	.05749	-.29145	-.31334	-.14205
49	.44085	.29152	-.31625	-.63702
40	.38000	.17653	-.03534	-.55496
43	-.05279	.16136	-.25511	-.54990
45	.22042	.11550	-.20308	-.52396
51	.15497	.01353	-.20644	-.52142
69	.05229	.04024	-.20090	-.49367
60	.38782	.47285	.02723	-.47993
14	.23392	.22121	-.13841	-.47232
38	.21621	.04296	-.22398	-.47101
18	.23329	.07150	-.30280	-.43968
19	.30274	.01375	-.13577	-.43283
37	.16206	-.07400	-.19603	-.42768
55	.11979	.34719	-.03247	-.41950
5	.17029	.16175	-.14057	-.41588
27	.31898	.37104	-.06262	-.40562
6	-.022581	.33831	-.30601	-.39300
64	.18531	.15727	-.18385	-.28868

APPENDIX D.

FACTOR CORRELATION MATRIX

FACTOR CORRELATION MATRIX

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1.00000			
Factor 2	.10905	1.00000		
Factor 3	-.27978	-.09224	1.00000	
Factor 4	-.26963	-.17149	.27198	1.00000

APPENDIX E.

REGRESSION EQUATIONS OF ENDOGENOUS VARIABLES

REGRESSION EQUATIONS OF ENDOGENOUS VARIABLES

Academic achievement = -5.44 + .28 (reading ability) +
.29 (language ability) + .33 (self-efficacy)

Self-efficacy = -1.91 + .24 (language ability) +
.28 (math ability) + .26 (concentration/preparation
for class) + .33 (motivation)

Concentration/preparation for class = .19 +
-.19 (life stress) + .26 (motivation) +
.45 (self-monitoring/usse of study strategies)

Self-monitoring/use of study strategies = .26 +
.55 (motivation)